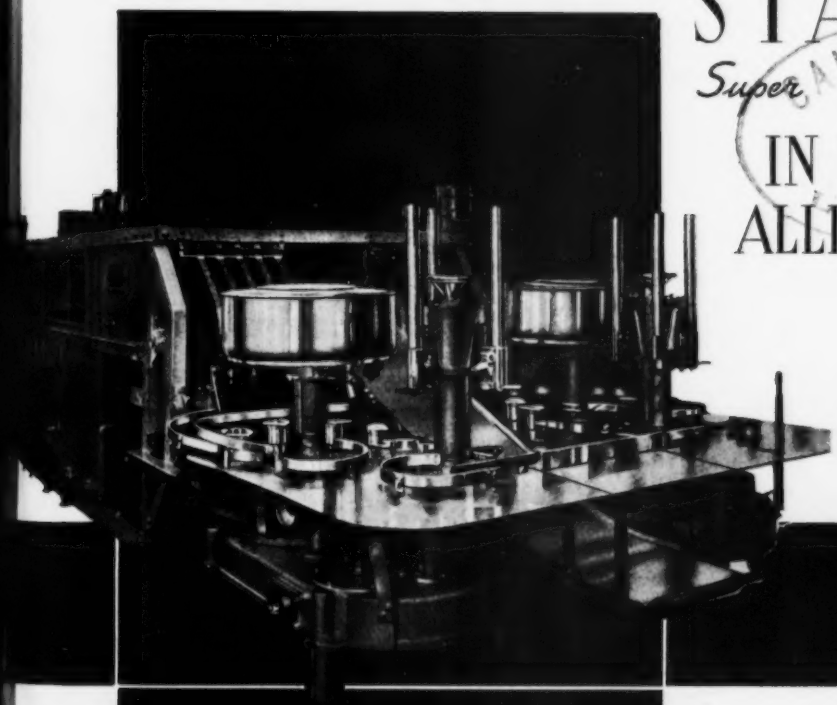
FOOD MANUFACTURE

FOOD MANUFACTURE (1926) LIMITED, 37 STRATFORD PLACE, LONDON, W.1. MARCH 1, 1944

"STAYBRITE"
REG. TRADE MARK
Super Stainless Steel

IN THE DAIRY & ALLIED INDUSTRIES



Owing to the large demand we are at present greatly restricted as regards the purposes for which this steel can be supplied.

RTH-VICKERS STAINLESS STEELS LTD SHEFFIELD

"ALL you're used to having at the price you'd like to pay" is one way to describe what you get when you buy your labels "the LITHESK way." Consider these things:

The LITHESK way — two blues, one red and one yellow can together reproduce every degree of colour, every combination of tones, with perfect registration and colour-value.

The LITHESK way — precision presses, conditioned papers, tested inks and varnishes, combine to produce a standard of label QUALITY unheard of before LITHESK.

The LITHESK way — micro-accurate cutters give perfection to thousandths of an inch on every label, ensuring trouble-free labelling and packing on automatic machines.

The LITHESK "revolving stock" plan cuts out your label inventory almost entirely, gives you labels "fresh and crisp as your daily bread," gives you keener prices by far whether your need is for 25,000 or 25,000,000.

And even when you are satisfied on these points, there is something more. LITHESK labels will get your products *shown*. The crisp finish, the fine quality look of LITHESK will become a definite and ever-growing asset in building goodwill and creating sales for your products.

THE PRINTEX MACHINES. These are the machines that make the giant plates, wafer sheets of shimmering metal each carrying 20, 30 and sometimes 40 different labels. Their high technical accuracy, coupled with conditioned papers, is the basis of "LITHESK" quality—and "LITHESK" economy, too!

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The Finest Quality at the Finest Price!

NOW IT'S YOUR TURN! *Whether you are a large or small user of labels and cartons, "The LITHESK Way" should be your way. Ask, without any obligation, for samples and constructive recommendations.*

BROWN & RAWCLIFFE LTD. *Lithographers* **4 HARRINGTON ST. LIVERPOOL**

TELEPHONE: BANK 5407-9

240145

— FOR — *"Service to Science"*

Under present conditions it is really important that no rubber shall be wasted in storage, and as we supply a very large quantity of bungs and tubing, we thought it ought to be part of our service to get, and pass on, some really authoritative advice on what to do :

HOW TO STORE RUBBER

1. Keep in the dark and never expose to sunlight or ultra-violet light if avoidable. This is the chief cause of deterioration.
2. Keep it cool. It need not be refrigerated, and if it gets stiff from excessive cold it must be warmed before use.
3. Store it in a way which will ensure its remaining free from kinks, as otherwise it may take a permanent set and be ruined.
4. Talcum powder or chalk may help a little to keep air away, but it is of doubtful value.
5. Complete exclusion of oxygen is useful, but ordinary sealed containers do not help unless they are evacuated or filled with an inert gas.

These are the recommendations of important rubber laboratories.

Actually we have put down moulds for really large rubber bungs as part of our "Service to Science" policy, since there seemed to be a real demand for them.

We can now supply moulded *rubber bungs in all normal sizes, and also up to* 4½" *in diameter in increments of* ¼", *all in our very special T.M.* 60 *quality.*

TOWNSON & MERCER LTD.

390, SYDENHAM ROAD, CROYDON

Telephone : Thornton Heath 3851 **Telegrams : Townson, Croydon**

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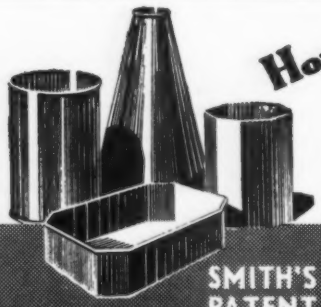
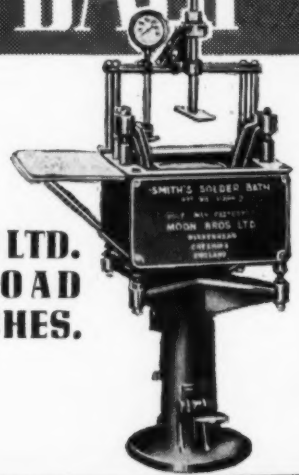


How much Time lost in Soldering these?

Hand soldering is wasteful both in time and material; this compact machine takes out the guesswork and regularises the output up to 175 cans per hour with unskilled labour. If this is your need, write to us for leaflet and quotation.

SMITH'S PATENT SOLDER BATH

Patent No. 312882



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Over 200 machines covering all requirements in the economical production of tin boxes are listed in our catalogues. May we send details?

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BEAUFORT ROAD
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A regular saving on irregular work.

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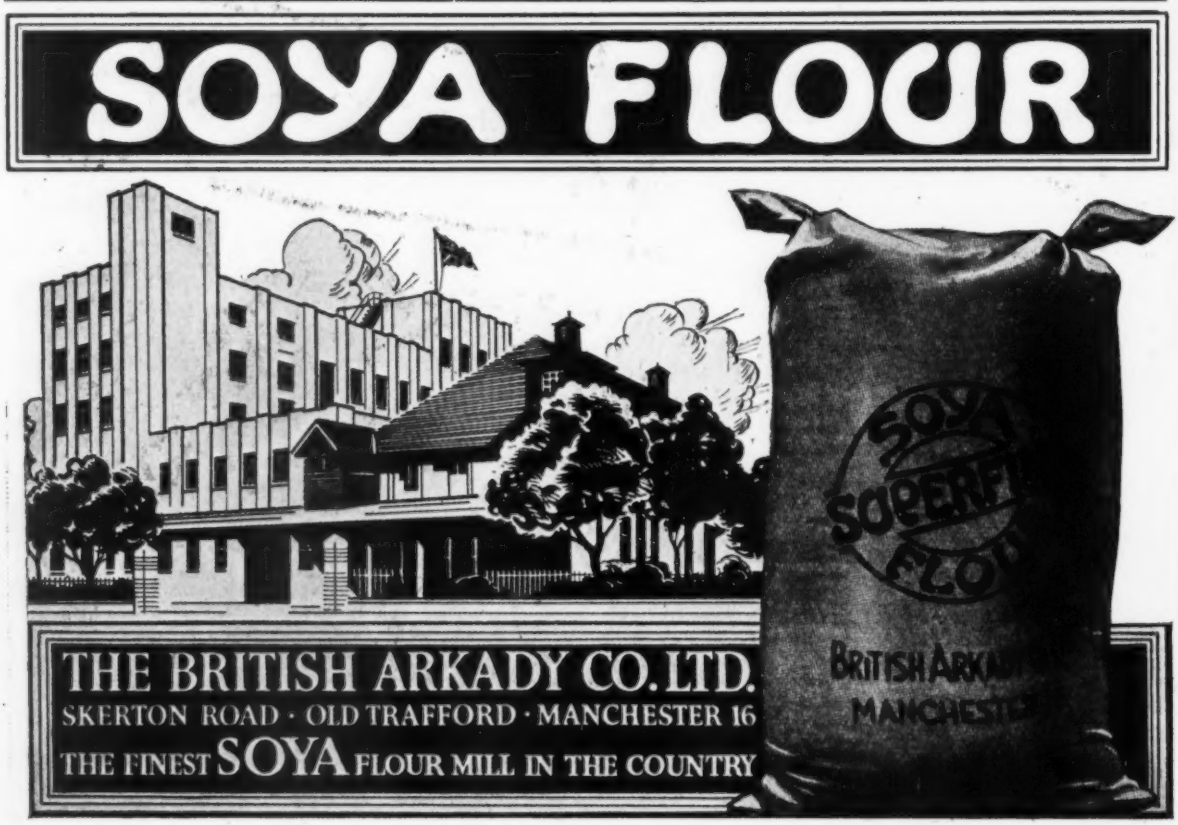
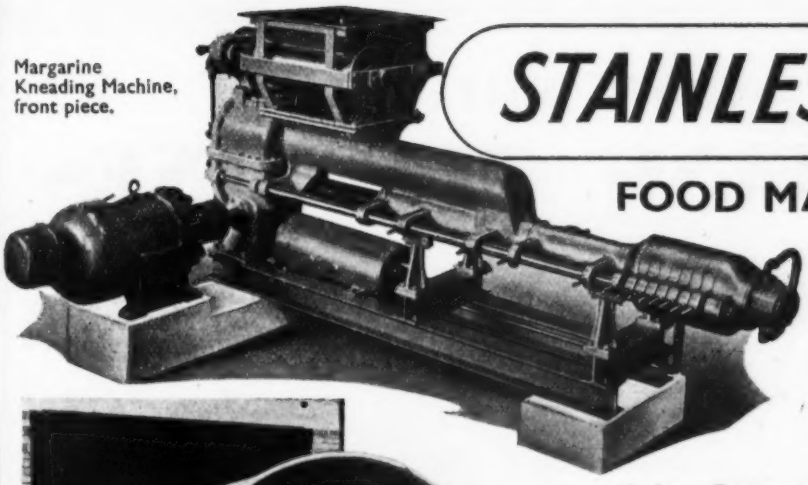


STAINLESS STEEL

FOOD MANUFACTURING EQUIPMENT



Margarine Kneading Machine, front piece.

The various types of Food Plant Equipment illustrated are but a few of the things we are making to help not only Food Manufacturers but also the NATIONAL EFFORT.

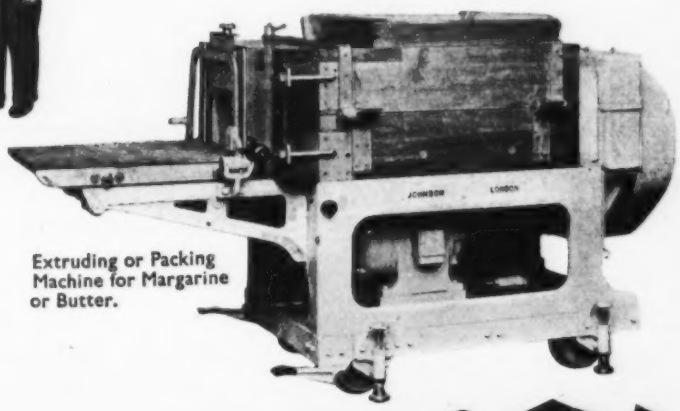
■ ■ ■

Modern Equipment requiring less operatives and releasing skilled maintenance workers for other types of Tanks—should be the order of the day.

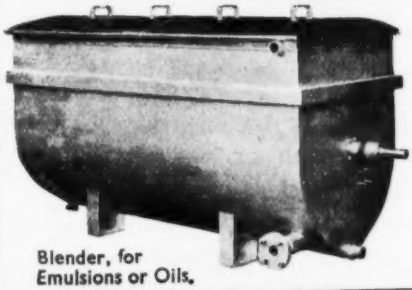
■ ■ ■

Our technical staff can solve YOUR problems as they have done other special ones connected with more serious matters—which you wouldn't want to know, or if you did—we couldn't tell you.

Storage Tank, nearing completion.



Extruding or Packing Machine for Margarine or Butter.



Blender, for Emulsions or Oils.

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AFRICA HOUSE, KINGSWAY, LONDON, W.C. 2 WORKS: DUKE'S ROAD, ACTON, W. 3

Stainless Steel Trucks going on Active Service.

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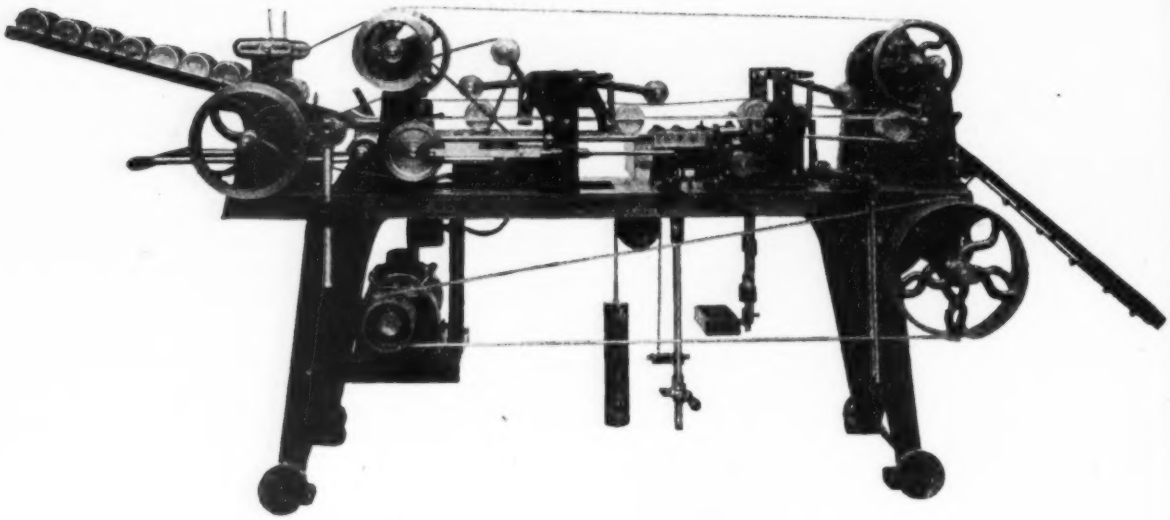

★ We are manufacturers, not agents, and have been manufacturing for the past 35 years. Buy from the makers and gain the advantage of their experience.

One Beth Labeller is adjustable to all round sizes. Will label any round can or package, with or without lids, at any desired speed without skilled operator and with very small power. The Paste does not touch the tin, therefore no rust is formed and brightly coloured labels are kept bright.
No waiting to dry.
Fitted with Castors, if desired.
Complete with or without electric motor-drive.

THE BETH LABEL & WRAPPER MACHINES LIMITED

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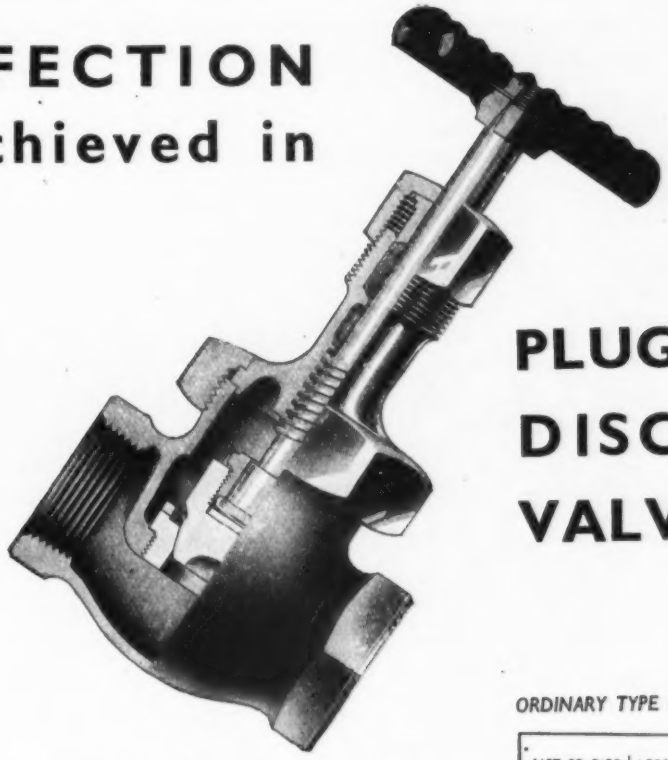
Telephone: ARCHWAY 2933
Telegrams: "Labwrap, Finspark, London"

PERFECTION achieved in



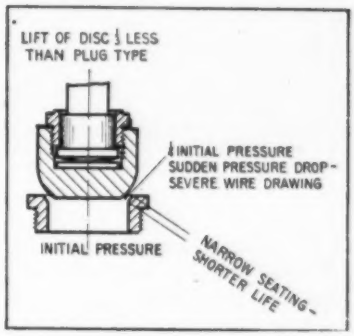
PLUG TYPE DISC VALVE

Steam Working Pressure up to 250 lb. Temperature up to 500° F.

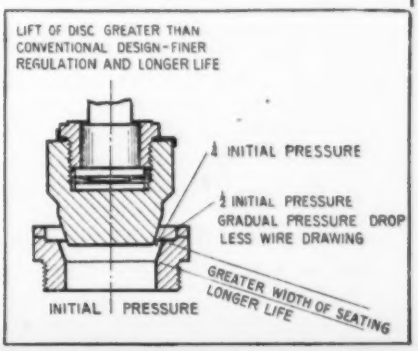
CRANE VALVE No. D. 46

The most important advance in Globe Valve design in recent years has been in the development of the Plug Type Disc and seat. The Crane D.46 steam valve is an outstanding example of this progress. It stands up to prolonged wear under arduous conditions because every detail has been designed scientifically and the ideal metal chosen for each component. This valve can be "throttled" under high pressure without damage to the seat; and re-packing can be done with the valve fully open.

ORDINARY TYPE DISC


LIFT OF DISC ⅓ LESS THAN PLUG TYPE
⅓ INITIAL PRESSURE SUDDEN PRESSURE DROP - SEVERE WIRE DRAWING
INITIAL PRESSURE
NARROW SEATING - SHORTER LIFE

CRANE PLUG TYPE DISC


LIFT OF DISC GREATER THAN CONVENTIONAL DESIGN - FINER REGULATION AND LONGER LIFE
¼ INITIAL PRESSURE
½ INITIAL PRESSURE GRADUAL PRESSURE DROP LESS WIRE DRAWING
GREATER WIDTH OF SEATING LONGER LIFE
INITIAL PRESSURE

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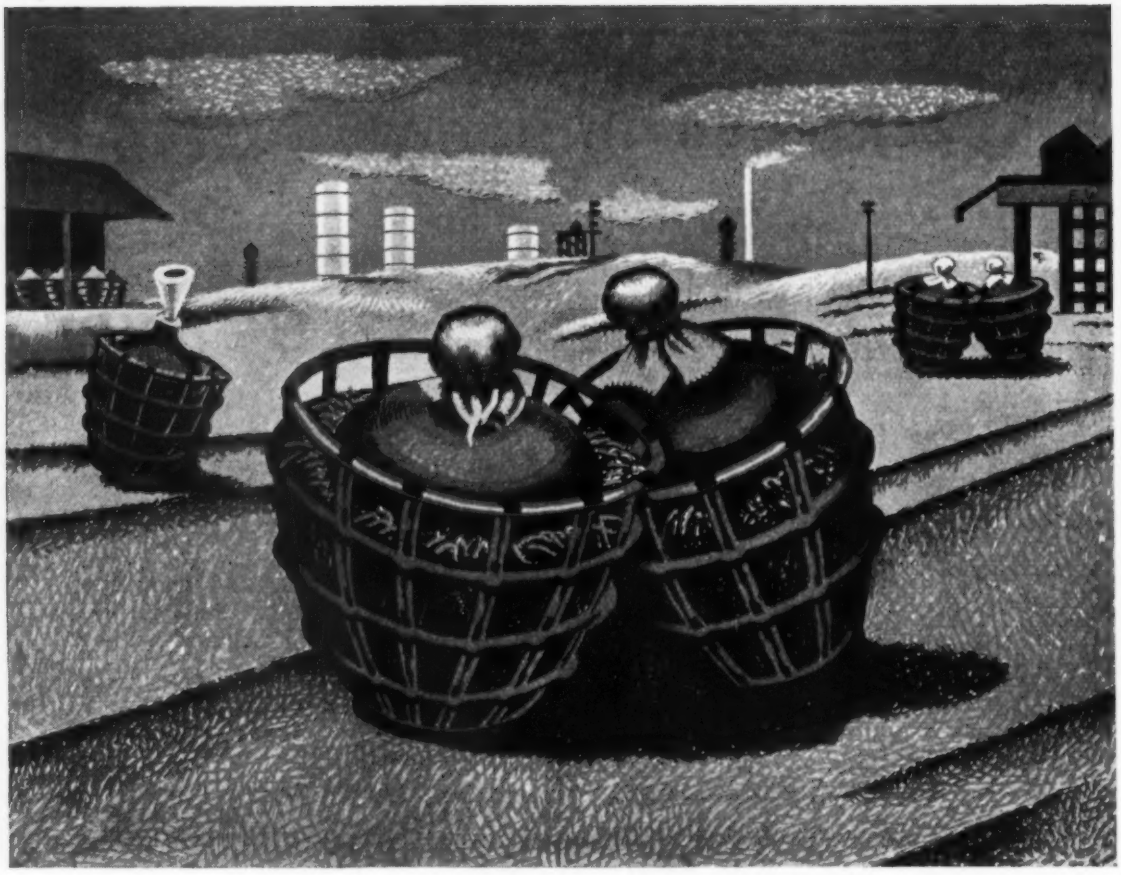

THE ACID TEST

NO mere colloquialism. Sulphuric acid is so widely used in Industry that it is commonly taken as an index to the state of trade. The acid is used as it is produced and therefore the chart of its consumption reflects the fluctuations of business quickly and closely. Acids, with their opposites, the alkalies, are both in volume and range of uses the most important direct contribution of the chemical industry to Production. There is scarcely a commodity, scarcely even a single article which can be made without either acids or alkalies entering at one or more stages of its manufacture. Sulphuric acid, otherwise known as oil of vitriol, is used in almost every conceivable industry. It is noteworthy that the modern method of producing the acid from iron pyrites, air and water was suggested in 1831 by Peregrine Phillips, a Bristol vinegar brewer. The other essential "heavy acids" are nitric and hydrochloric. Tens of thousands of tons of nitric acid, once known as "aqua fortis" or "strong water," are produced by the British chemical industry every year, and more in war even than in peace, for it forms the basis of nearly all explosives, as well as of the inorganic fertilizers which are today required in increasing quantities to grow more food from British soil. Hydrochloric acid, or spirit of salt, is a combination of hydrogen with chlorine and finds wide uses in the metal pickling, tanning and textile trades. The heavy acids are in one sense the manufactured products of the chemical industry. In the much wider sense they are essential raw materials without constant and adequate supplies of which the wheels of production would stop turning. It is reassuring that the British chemical industry is the largest manufacturer of heavy acids in the world.

ICI

Imperial Chemical Industries Limited, London, S.W.1.

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Good lighting, so closely allied to production and the welfare of workers is vital. If your installation needs better planning—or changes are required here and there to take care of new processes—or extensions are necessary—consult the G.E.C. Take advantage of the knowledge G.E.C. lighting specialists have gained in helping wartime factories towards full production.

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FOR

FOOD PREPARING, MANUFACTURING AND CANNING

COMPLETE CANNING LINES

SUPPLIED FOR

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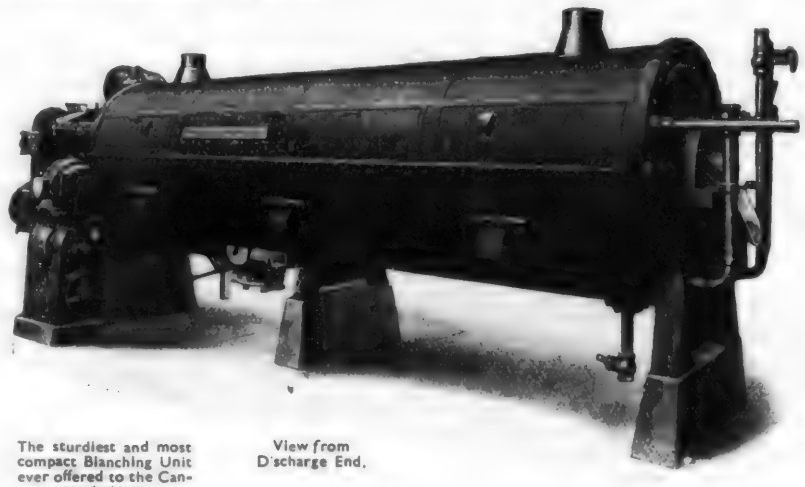
Rotary Syrupers; Pulpers; Slicing and Dicing Machines; Rotary Filling Machines for soups and all liquids; Pea Shelling Machines; Pea and Bean Blanching Machines, as illustrated on this page; Pea and Bean Filling Machines; Washing, Pickling, Scalding and Cooling Conveyors for Tomatoes, etc.; Air Compressors; Rotary Bottle and Jar Washing Machines; Hydro Jar Washing Machines; Biscuit Tin Washing and Delabelling Machines; Can Washers; Fruit and Berry Washers; Orange Peeling and Pulping Machines; Filter Presses; Vacuum Concentrators and Evaporating Plants, etc., etc.
Vacuum Sugar Boiling Plants; KELLIE Extra Rapid Boiling Pans; Automatic Jam Filling Machines; Conveyors, Elevators, Cookers and Coolers, Boiling Pans (all types), in Cast Iron, Copper, Monel Metal, Stainless Steel, Pure Nickel, Inconel, etc. Exhausters (steam and or water), Disc or Rotary type, also combined Syrupers and Exhausters.

Original inventors and sole makers of the KELLIE-YATES Filtration Process of Fruit Preservation. The hygienic, scientific and economical modern method of making Jams, Jellies, Marmalades, Pectin, Sugar Syrup, Fruit Juices, etc. Over 100 complete installations are now in operation in Preserve Factories throughout the world producing high-class preserves of finer flavour and greater clarity at a fraction of their former manufacturing costs.

"KELLIE" CONTINUOUS MOTOR-DRIVEN PEA AND BEAN BLANCHER

With infinitely variable blanching periods.



The sturdiest and most compact Blanching Unit ever offered to the Canning Industry.

View from Discharge End.

Fabricators of Boiling Pans (all types) in Stainless Steel, Monel Metal, Pure Nickel, Inconel, Copper, etc.

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The Dundee Foundry, DUNDEE

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Manchester Representative: MR. A. E. FIELDING, Queen's Chambers, 2 Ridgefield, MANCHESTER

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EMERGENCY

The need for conserving tin is imperative and urgent. The total tin consumption of this country **must be drastically reduced.** Solder is one of the main uses of tin.

To meet this emergency, Fry's have produced a solder which contains only 5% tin with other ingredients to improve the fluidity and strength.

FRY'S NEW SOLDER T·M·5

(Patent applied for)

has been thoroughly tested in the laboratory and it has been well tried in industrial conditions, but there is no time to test it in manifold ways before we put it on the market.

You can help by trying it on your work, not with just a lb. or two, but with, say, 28 lbs. We are sufficiently confident about it to say that it is well worth your while to take a little trouble in testing it in order to help save tin.

PROPERTIES OF T.M.5		
Melting Point		282°C 540°F
Tensile Strength of Solder	tons/sq. in.	4.26
Elongation %		23
Strength of lap joint in brass or steel	tons/sq. in.	1.8 2.3

¶ T.M.5 is a low price alloy, so even where a slight increase over the normal amount of solder per job is necessary, there is a substantial saving in price, as compared with solders previously used.

¶ Where T.M.5 can be used efficiently to replace solder to Service specification, approval can be sought.

Further information on request.

FRY'S METAL FOUNDRIES LTD.

LONDON

AND AT MANCHESTER · BRISTOL · GLASGOW and DUBLIN

FRICTION RING MANUFACTURE

Stamping, curling, lining and drying at the rate of 150 per minute on our No. 25 Press, No. 281 Curler, No. 19 Compound Applier, and No. 206 Dryer.

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240 North Ashland Avenue
Chicago U.S.A.

British Manufacture Throughout

Tinplates and Blackplates

The Baldwin range includes a branded Tinplate for every purpose. These Tinplates are STANDARD brands regularly used in all parts of the world for every kind of canning and deep stamping work.

As the original makers of Open Hearth Siemens Basic Steel with complete control of materials from iron ore to finished product, Baldwins are able to offer exceptional advantages to users of Tinplate.

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Cables : "Baiwinza, London."
South Wales Branch and Collieries Office : 45 Wind Street, Swansea
'Phone : Swansea 4941 (8 lines). 'Grams : "Baldwins, Swansea."
London Sales Office : P.O. Box 255, 6 Broadway, Westminster
'Phone : Abbey 1853. 'Grams : "Promptitude, Rand, London."
Cables : "Promptitude, London."
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Two "Broadbent" 54" Belt-Driven Centrifugals with Lift-out, Tip-over Baskets and Overhead Runway

BROADBENT CENTRIFUGALS

STANDARD DESIGNS IN A VARIETY OF SIZES FOR STEAM, BELT, MOTOR OR DIRECT ELECTRIC DRIVE.

FIXED OR LIFT-OUT BASKETS, WITH STAINLESS STEEL OR MONEL FITMENTS THROUGHOUT.

ALSO SPECIAL DESIGNS FOR SECRET PROCESSES.

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ARE USED IN THE MANUFACTURE OF MOST OF THE

WORLD-FAMOUS FOOD PRODUCTS

MAXIMUM FILTRATION, CLEANLINESS AND MECHANICAL RELIABILITY GUARANTEED

Literature and Technical Information on request

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Flooring!

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A SPECIFIC FLOOR FOR A PARTICULAR PURPOSE

We have spent fifteen years in research and practical work in connection with floor surfaces of every description, acid-proof and non-acid. We have a large modern Works, a fully equipped Laboratory and excellent Drawing Office facilities, and are therefore in a unique position to advise regarding ANY FLOORING PROBLEM put up to us.

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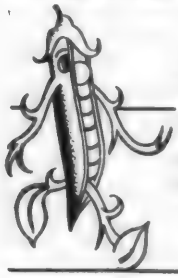
the ministers of security

Anti-acid, non-poisonous gold coating, preserves the rich fresh colour and flavour of fruits.

SUPER ZINNATINE



Thesulphur resisting ZINNATINE, prevents those blackening stains in vegetable packs.

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Preserves the fresh sea flavour of fish a lacquer film that will not fracture in the process of deep drawing.

ZINNATINE MARINA

No matter what type of product you can, there's a Zinnatine Lacquer that will guarantee neutrality between the can and the contents. . . . No acid attack can break through . . . the perfect preservation of the neutral colour and flavour of the original product is guaranteed.

Zinnatine Lacquers give security in every can —ensuring every product turning out in its natural state of perfection. That's the security that makes the best propaganda for your products.

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MOBILISATION OF WOMEN

from a painting by M. MACKINLAY

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It is the thought behind this message that is important. These few words have been written again and again in an endeavour to express the amount of thought and careful consideration that is put into the design, production and application of Benjamin Reflectors — the complete Benjamin Service. It has carried Benjamin equipment into all kinds of factories all over the World. It means that Benjamin have something specially suitable for the lighting of your plant.

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LONDON CALLING ! Every day, London calls YOU, wherever you are, with the news from Britain—up-to-the-minute, truthful.

Details of all coming broadcasts IN ENGLISH are transmitted every Sunday morning —by Morse Code from London—to the British government or local broadcasting Authorities in your own area, and thus supplied direct to the Press for publication. They can supply, nearly everywhere, advance details of programmes from Britain in all other languages, too. If you cannot find the British programmes in your own paper, the Editor may not know you would like them. Ask him to publish them each week.

Throughout Europe, men and women are risking imprisonment, and even death, to hear the news from London, because they know it tells them the truth.

SO LISTEN . . . TO THE VOICE OF BRITAIN—AND OF FREEDOM !

¡LONDRES AL HABLA! Todos los días Londres os habla, dondequiera que esteis, con las noticias de la Gran Bretaña veraces y del último minuto.

Todos los domingos por la mañana son transmitidos—por Morse, desde Londres—EN INGLÉS los detalles de las futuras emisiones a las Autoridades oficiales británicas y a las emisoras locales, a fin de que sean conocidos directamente por la Prensa para su publicación. En casi todas partes, pueden suministrar, también por anticipado, los programas detallados de otras emisiones en lenguas extranjeras desde Londres. Si no encontráis los programas británicos en vuestro periódico, quizá sea porque el Director no sabe que os gustaría hallarlos. Pedidle que los publique todas las semanas.

En toda Europa, hombres y mujeres arriesgan la prisión, e incluso la muerte, por oir las noticias de Londres, porque saben que les dice la verdad.

POR ESTO, ¡ESCUCHAD . . . LA VOZ DE LA GRAN BRETAÑA —Y DE LA LIBERTAD!

یہ لندن ہے! ہر روزہم لندن سے تم کو، جہاں کہیں ہو، ہرلمحہ کی صحیح خبریں دیا کرینگے۔ ہر اتوار کی صبح آئندہ کے سب انگریزی براڈ کاسٹ حکومت برطانیہ کو آور تمہارے علاقہ کے مقامی براڈ کاسٹنگ اسٹیشن کو «مورس کوڈ» کے ذریعہ تفصیلوار بھیجے جاتے ہیں اور اسی طرح چھاپہ خانے کو بھی مشتہر کرنے کے لئے دئے جاتے ہیں۔ برطانیہ کے آئندہ تفصیلاً پروگرام تمام زبانوں میں ہر جگہ وہ پیش کرتے ہیں۔ اگر تم کو کہیں برطانوی پروگرام اپنے اخبار میں نہ ملے، شاید ایڈیٹر سمجھتا ہو کہ تم کو پسند نہیں۔ اس کو درخواست کرو کہ وہ ہر ہفتہ آن کو چھاپیں۔

یورپ میں لندن سے خبریں سننے کی خاطر مرد اور عورتیں قید میں جانے یا جان دینے کی بھی پروا نہیں کرتے کیونکہ وہ جانتے ہیں کہ صحیح خبریں لندن ہی سے آتی ہیں۔ برطانیہ کی خبر سنو کہ وہ آزادی کی صدا ہے۔

لندن تناديكم. لندن تناديكم انتم كل يوم. اينما كنتم وحيثما حللتم تناديكم لتطلعكم على الاخبار من بريطانيا. آخر الاخبار واصدق الانباء. إن تفاصيل كل الاذاعات القادمة تذاع باللغة الانجليزية بشفرة المورس الى السلطات البريطانية او سلطات الاذاعة المحلية فى اقليمكم وهذه ترسلها رأسا الى الجرائد لنشرها. فهى يمكنها أن تعطى جريدتكم مقدما وفى كل مكان تقريبا التفاصيل الوافية عن البرامج التى تذاع من بريطانيا بلغتكم وبكل اللغات الاخرى ايضا.

فاذا لم تجدوا البرامج البريطانية فى جريدتكم فربما لم يعلم رئيس تحريرها انكم ترغبون فى الاطلاع عليها فاطلبوا منه أن ينشرها لكم كل اسبوع إن كثيرين من الرجال والنساء فى انحاء اوروبا جميعها يجازفون بحريتهم بل بارواحهم لكى يستمعوا الى اخبار لندن لانهم واثقون أنها تطلعهم على الحقيقة الصادقة.

فاستمعوا اذا . . . الى صوت بريطانيا . . . صوت الحرية.

Mr. Price gardening

MR. PRICE is our caretaker (he looks after our garden very well too).

He doesn't know anything about steam trapping and we doubt even if he knows the front end of a steam trap from the back end.

But if we said to him, "*Proper steam trapping, Mr. Price, can knock ten to twelve per cent. off the coal bill*," that would be something for him to bite on and chew over. It would be the best of all first lessons in steam trapping.

Then, if he were machinery-minded, we could go on to tell him that proper steam trapping can make steam-heated equipment work better and turn out more stuff per pound of steam used.

Probably you, as a food manufacturer, will know more about steam traps than does Mr. Price, but we wonder if there aren't a lot of things about specialised steam trapping you haven't realised.

You know, steam traps are just lumps of metal, but specialised steam trapping is something quite different.

The astonishing way in which proper steam trapping (and air venting) can save coal is one of the things that perhaps you haven't yet discovered.

If so, may we suggest that you let us prove to you that we are not talking through our hat?

At the right is an enquiry slip. If you will please fill in the answers to the few questions we will try to show you, without obligation of course, what can be done to make your coal go further.

Will you please fill in, tear out and send off the slip now? You've nothing to lose, but quite a lot to gain.

SPIRAX MANUFACTURING CO. LTD.

CHELTENHAM, GLOS.

Telephone: [Cheltenham 5175 Telegrams: Spirax, Cheltenham
LONDON OFFICE: 28 VICTORIA ST., S.W.1. Tel: Abbey 6101

ENQUIRY FORM

If you would like to have our recommendations for saving fuel and for increasing output, will you please fill in these brief details? This puts you under no obligation:

Name

Address

Number and types of steam-heated plant, with working pressures:

Boiler pressure:

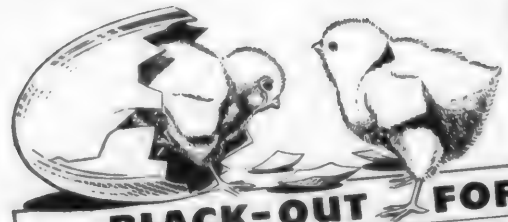
Coal used per week:

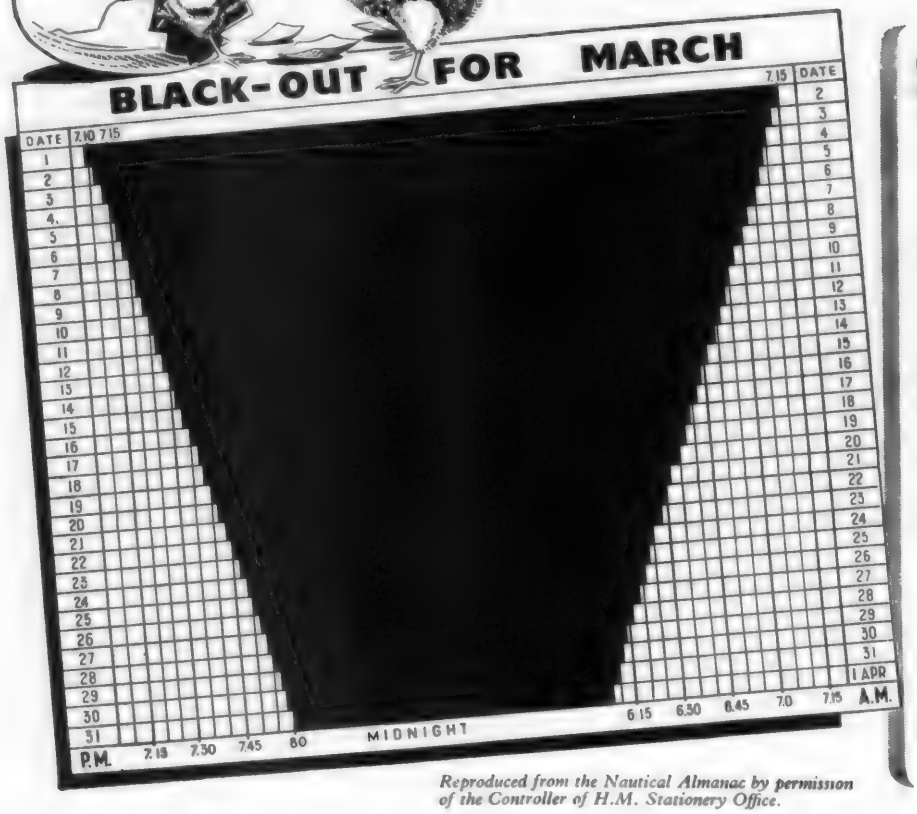
Average working hours:

Types of steam trap used:

Do you collect all your clean condensate?

Looking Brighter





Reproduced from the Nautical Almanac by permission of the Controller of H.M. Stationery Office.

Good lighting has played a very important part in the big production drive during the Winter. Black-out, to a large extent, has been defeated.

The effects of darkened windows, however, are still with us even now the black-out period is getting shorter . . . There is still plenty of scope for good lighting with its beneficial effect upon output and the welfare of workers—with, of course, the assistance of OSRAM lamps.

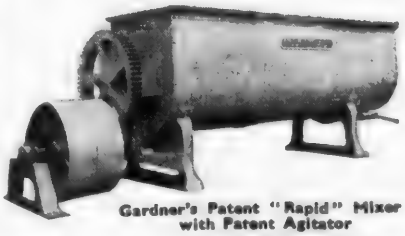
Osram

A G.E.C. PRODUCT

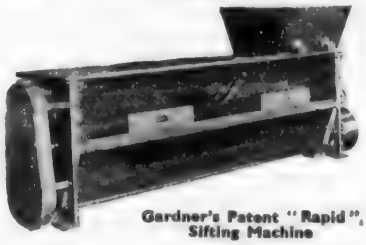
THE WONDERFUL LAMP

Advt. of The General Electric Co. Ltd., Magnet House, Kingsway, London, W.C.2

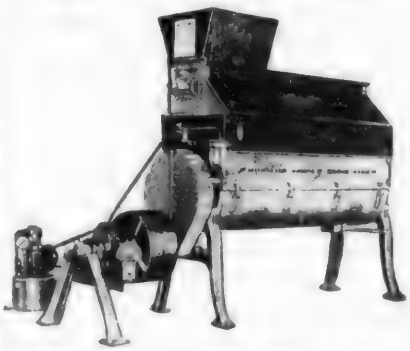
These machines provide THOUGHT FOR FOOD



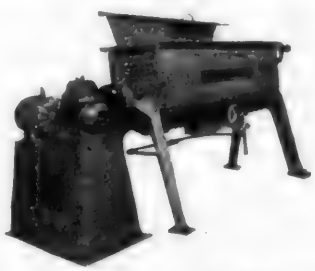
Gardner's Patent "Rapid" Mixer with Patent Agitator



Gardner's Patent "Rapid" Sifting Machine



Gardner's Patent "Rapid" Sifter and Mixer with Sprayer



Gardner's Patent "Rapid" Steam Jacketed Dryer and Mixer

GARDNER'S Machinery for the reducing, sifting, mixing and drying of powders for use in the food industry have been carefully designed to maintain a high standard of product at the lowest possible operating cost. They have proved their outstanding superiority over a period of nearly a century and are the first choice of discriminating manufacturers in all parts of the globe. Many machines have been running continuously for as long as 40 years without breakdown or repair, and they will stand up to any and every sort of climatic conditions. Our service department will be glad to advise on your own reducing process problems without obligation ; just send a sample of your product and we will test it out in our works and let you have our report on the most suitable method of reduction. In our range of models there is one to solve your problem . . . why not get in touch with us NOW.

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Machinery for the

FOOD INDUSTRY

Write for Complete Catalogue :

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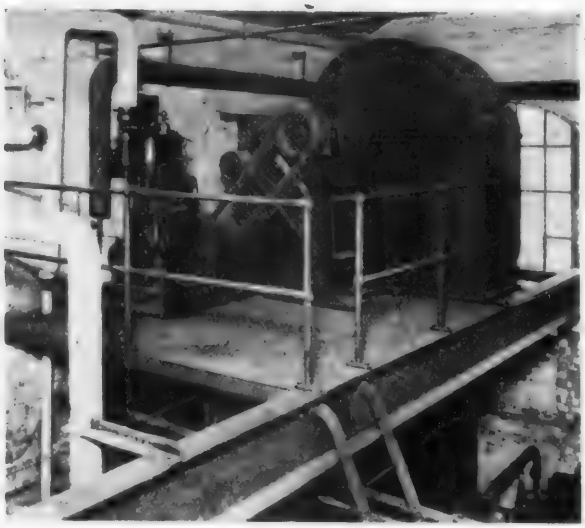

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Get the best out of your Boiler Fuel

INSTALL STURTEVANT MECHANICAL DRAUGHT

We are specialists in Forced and Induced Draught equipment, and can help you solve your combustion problems. Sturtevant Mechanical Draught Systems are described and illustrated in our post-free publication, W1077A.

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ELECTRICAL EQUIPMENT

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Everything Electrical

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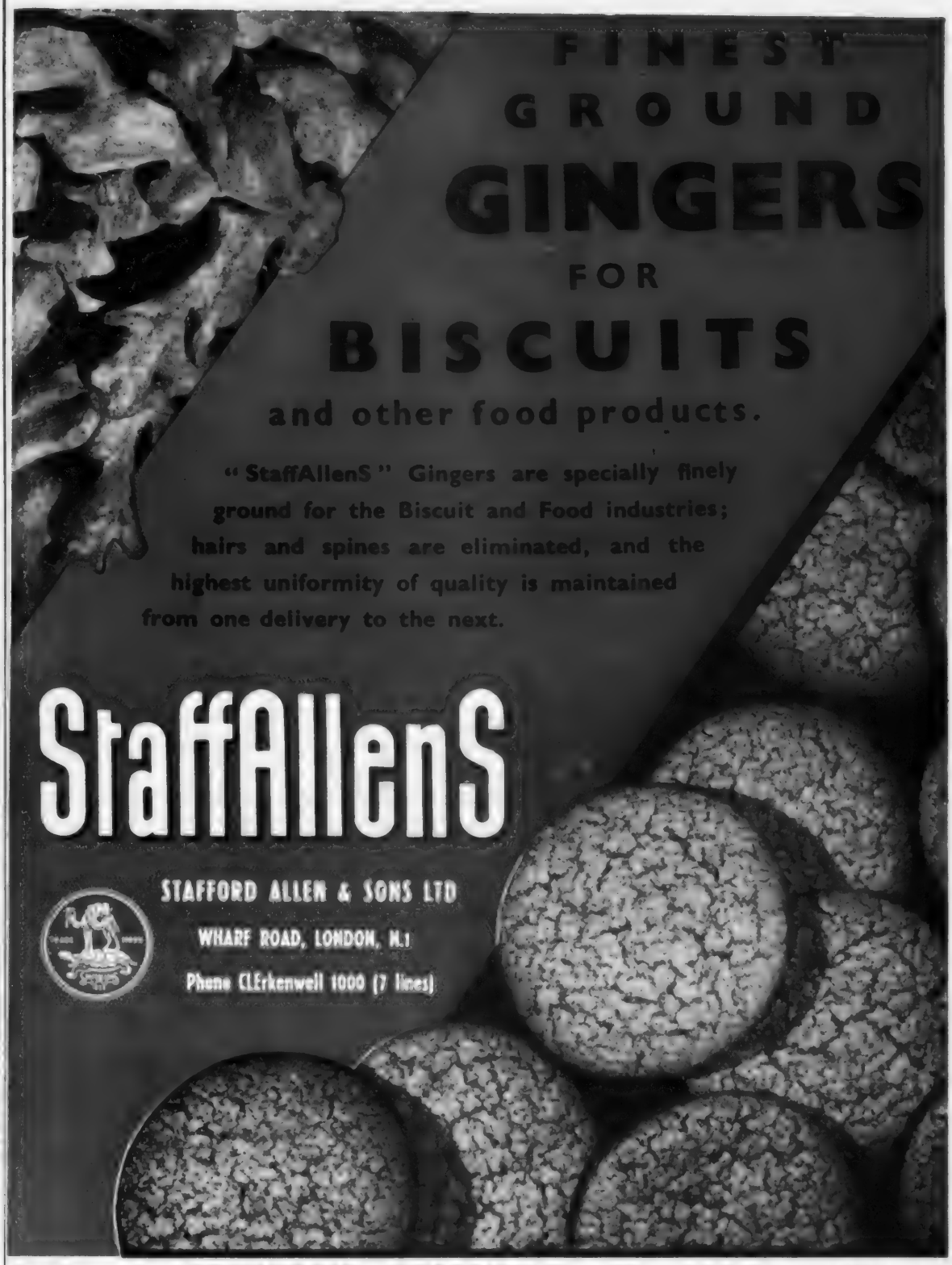
with assurance of efficient and smooth operation

Two grinders and a small blender driven by G.E.C. motors—15 h.p., 6 h.p. and 4½ h.p. respectively.

Two blenders 1-ton and 1½ tons capacity, driven by 5 h.p. (450 r.p.m.) and 6 h.p. (970 r.p.m.) slip-ring motors respectively.

Two views of a typical installation.

Advt. of The General Electric Co. Ltd., Magnet House, Kingsway, London, W.C.2.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and other food products.
"StaffAllenS" Gingers are specially finely ground for the Biscuit and Food industries; hairs and spines are eliminated, and the highest uniformity of quality is maintained from one delivery to the next.
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OVER A CENTURY'S EXPERIENCE OF SPICE MILLING

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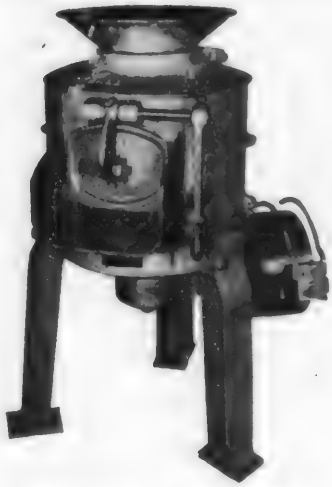
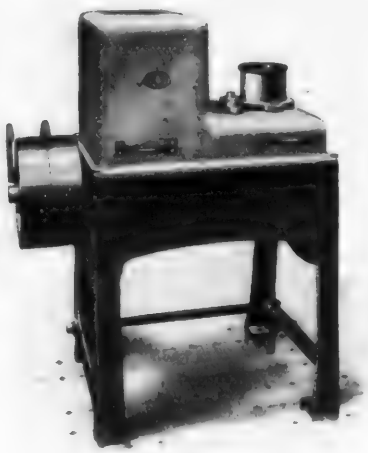


PEELING & WASHING MACHINE

For Potatoes, Carrots, Turnips, Swedes, Beets, Gooseberries, Plums, Apples, etc.

Direct Motor Drive if required.



VEGETABLE DICING MACHINE

Output up to 1 ton per hour.
Best cut. Least waste.
Easily changed to Plain Slicing.

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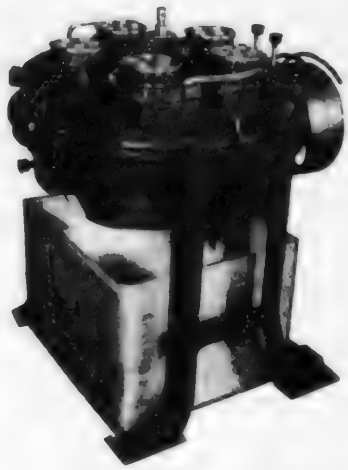

SLICING MACHINE

For Carrots, Turnips, Beetroots, Rhubarb, etc.
Variable thickness.

Direct Motor Drive if required.

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'Phone : Rochdale 4181. 'Grams : "Bricohar, Rochdale."

London Office (Temporary Address) :

SUNRIDGE, RUDEN WAY, EPSOM DOWNS, SURREY. Telephone: Burgh Heath 2749.

Defiant! . . . but Science will get him

Generations of contact with danger has developed in rats a degree of suspicion and cunning unequalled by anything that the human brain can conceive.

To combat this cunning, you must enlist the aid of science—a fact which has been proved over and over again by the successful scientific methods employed by the British Ratin Company throughout the country : methods which are fatal to rats and mice, but quite harmless to domestic animals and birds.

The British Ratin Company has no preparation for sale to the general public : it offers only the services of its skilled operatives.

Fill in the coupon and the Ratin Company's local surveyor will call and give you an estimate for dealing with your infestation.

The Ratin Service is available anywhere in Great Britain and Ireland.

The Service also deals effectively with beetles, cockroaches, and other insect pests.

RATIN SERVICE

First ALLAYS Suspicion - then DESTROYS Rats

To THE BRITISH RATIN CO., LTD., 58, Kingsway Corner Buildings, London, W.C.2
Tel.: HOLborn 0401

Please ask your Surveyor to call and explain how the Ratin Service (preparation not supplied) deals with rats, mice and insect pests.

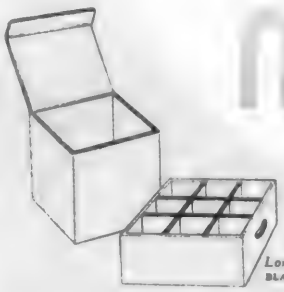
Name.....

Address.....

Date of appointment..... *Time*.....

Into the Sunlight

We like to look out of the shade into the sunlight to the time when rationing and black-out are things of the past and normal production is once more the concern of every manufacturer. Meanwhile the Medway Organisation does its best to meet the demands made upon it, knowing that the day will come when it can produce without difficulty containers which will protect your goods and enhance the fame of your products.



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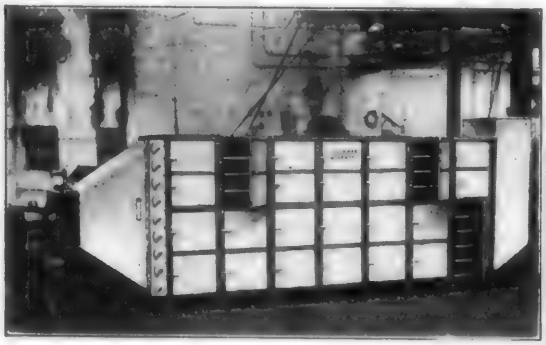
The Half-a-crown Standard

IT is not difficult when looking upon those miracles of engineering, the atmospheric pumping engine, and the early locomotives of our ancestors, to allow the possibility of truth to the legend of matching diameters to within half-a-crown. Whether it be true or no, we have the authentic words of James Watt, the famous engineer, to his contemporary, John Smeaton, regarding a cylinder which was bored "not farther distant from absolute truth than the thickness of a thin sixpence at the worst part." To-day, when every machinist has a 'one-inch mike' in his overall pocket, and 'go' and 'not go' gauges set the toleration of inaccuracy to within a thousandth of an inch, it is not surprising that the 'half-crown standard' has departed from most industries and accuracy and purity are no longer considered the dream of the idealist, but the practical measure of everyday achievement. Between the half-crown and the micrometer lie also the measure of change in filtering standards, and the removal of unwanted minutiæ from liquids and gases are problems that to-day need seldom trouble the industrialist or hinder the march towards absolute purity.

BRITISH FILTERS LIMITED

AIRCRAFT HOUSE, MARKET HARBOROUGH



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Compartment Dryers
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for all materials

Specialists in the design and construction of all types of Dryers, our wide experience is at your disposal. Let us advise you as to the most efficient and economical plant suitable for your own particular purpose. The illustration shows a Musgrave Cupboard Dryer for Confectionery.

Musgrave *and Company Limited*

Brettenham House, Lancaster Place, London, W.C. 2
BELFAST · GLASGOW · MANCHESTER · BRISTOL · CARDIFF

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DOING THEIR PART TO KEEP THEIR CUSTOMERS SMILING TOO; BY MAINTAINING THE QUALITY AND THE SUPPLIES OF "MIKAH" ADHESIVES.

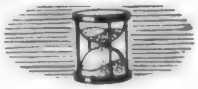
NATIONAL ADHESIVES LIMITED

SLOUGH, BUCKS

Telephone: Slough 23344

TEAK

STANDS THE TEST OF TIME.



The physical and chemical actions which break down wood take longer to affect Teak. That's why Teak lasts. A very simple explanation, but very important.

Why not remember it when ordering a boiling vat, for instance, which is partly subject to moisture and partly to fatty acids? Why not use the timber that is least affected by both? In other words, use Teak. It lasts longer.

The same elemental facts also apply to floors and work benches. Floors are always a problem. Either they crumble; or "dust"; or tire operatives' feet. But Teak doesn't do any of the things it shouldn't do. It just stays put. And lasts.

Teak is Tectona grandis. Other timbers, miscalled "Teak," are not Tectona grandis and have not the properties of true Teak. Burma Teak is true Teak. Nor is Teak costly, as the Timber Control price list shows.

BURMA TEAK

Withstands the Acid Test!

Issued by the Burma Teak Shippers, 4 Crosby Square, E.C. 3

TO SEE A FINE LADY

UPON A WHITE

(AS LYMM-PURE-SALT) HORSE

You can see the whiteness of Lymm-Pure-Salt. You cannot see its purity. That's why it is important to look for the Guarantee—99.98% pure—on every invoice for salt.

LYMM-PURE-SALT

SNOWDROP BRAND

Guaranteed 99.98% pure

SIGNED GUARANTEE OF PURITY

"WE Guarantee our 'LYMM-PURE-SALT' to be absolutely Pure Salt, containing 99.98% Sodium Chloride on dry sample. It contains no SULPHATE OF LIME (Plaster of Paris). Sulphate of Magnesia, Chloride of Magnesia. Chloride of Barium, SULPHATE OF SODA or any adulteration."

Charles Moore & Co. Ltd.

Charles Moore & Co Ltd., Lymm, Cheshire. All enquiries to Sales Managers —Honeywill & Stein Ltd. Wartime Address: Great Burgh, Epsom, Surrey.

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It was in 1841 that the House of White, Tomkins and Courage Ltd. was established.

Today the business is pre-eminent in its field; it having been built up by supplying the highest quality goods at reasonable prices.

Large Mills and Factories are established in LONDON, LIVERPOOL, BELFAST, TANDRAGEE and REIGATE.

The business in ESSENTIAL OILS, ESSENCES, FLAVOURINGS AND HARMLESS FOOD COLOURS is conducted from North Albert Works, Reigate.

In peace and war the best possible service is given to the Trade by

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COCHRAN

for process steam and hot water

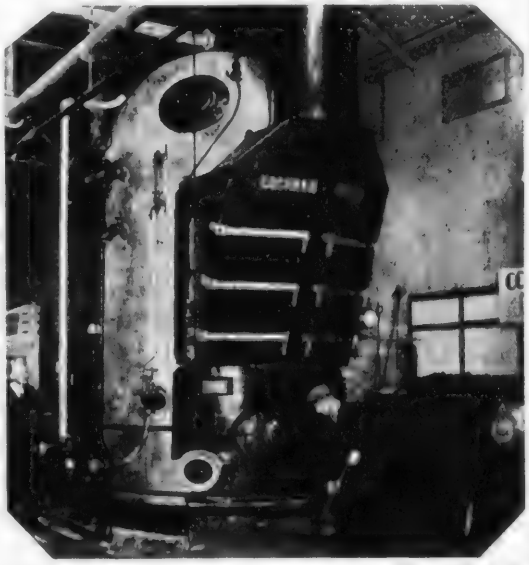
VERTICAL BOILERS

The famous Cochran Vertical Boiler has three major advantages:

(1) It is accessible on the water side for descaling, so that maintenance is easy and **continued efficiency** assured.

(2) It is a fine piece of engineering workmanship, proof against the usual troubles.

(3) In terms of fuel consumption it is the most economical of its type; and its rating provides ample reserve.



Makers of

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ELLIOTT INSTRUMENTS FOR FOOD STORAGE, PRESERVATION AND MANUFACTURE
GAS ANALYSIS EQUIPMENT AND DISTANCE THERMOMETERS FOR COLD STORES. TEMPERATURE MEASURING EQUIPMENT FOR PROCESS CONTROL IN FOOD MANUFACTURE AND STORAGE.
ELLIOTT BROTHERS (LONDON) LTD
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NATIONAL CONCENTRATED FOODS

PROTEX

A Vegetable Extract with high Amino Acid content. Manufactured by Fredk. Boehm Ltd.

As a base, incorporated in foodstuffs, PROTEX has been accepted as a standard ingredient by the leading food manufacturers and is valued chiefly for its power of enhancing the characteristic flavour of almost any food preparation.

YEATEX

A Yeast Extract manufactured by the Trent Yeast Extract Co. Ltd., from Brewers' Yeast. Rich in Vitamin B. A most highly concentrated food, easily digested with the highest nutritional and health value. Possessing a pleasant aroma and flavour.

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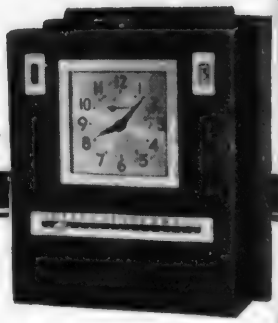
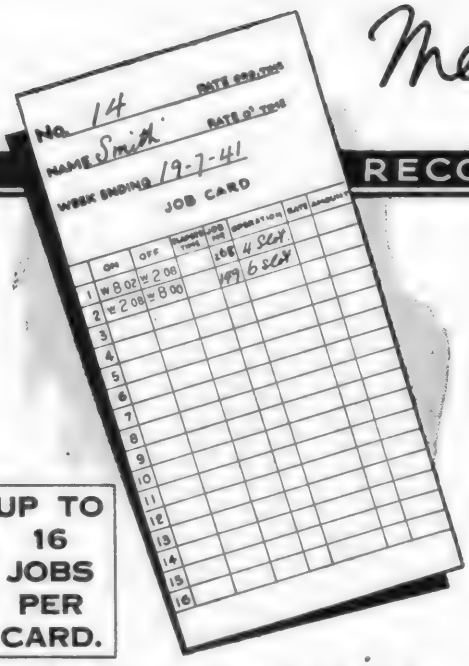
Mechanically Correct

RECORDS OF TIME





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- Accurate production time records
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- Speedier recording.
- Applicable to any cost system.
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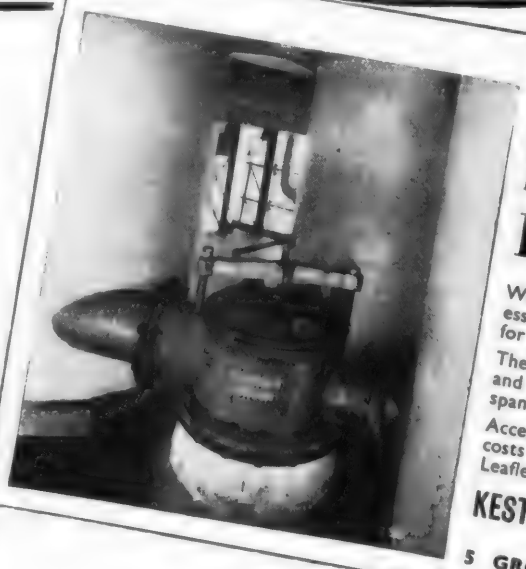

Simplicity

is an outstanding advantage in the design of the

Kestner Evaporator

When an Evaporator is used on Food Products it is absolutely essential that the tubes and tube plates are readily accessible for cleaning and sterilization.

The photograph shows the access door for cleaning the tubes and tube plates, the door is opened without the use of a spanner in a few seconds, and gives complete access.

Accessibility, high evaporation, efficiency and low running costs are ensured with the Kestner Evaporator. Write for Leaflet No. 259.

KESTNER EVAPORATOR & ENGINEERING CO. LTD.

CHEMICAL ENGINEERS

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AN AID TO INDUSTRY AND SERVANT OF THE STATE

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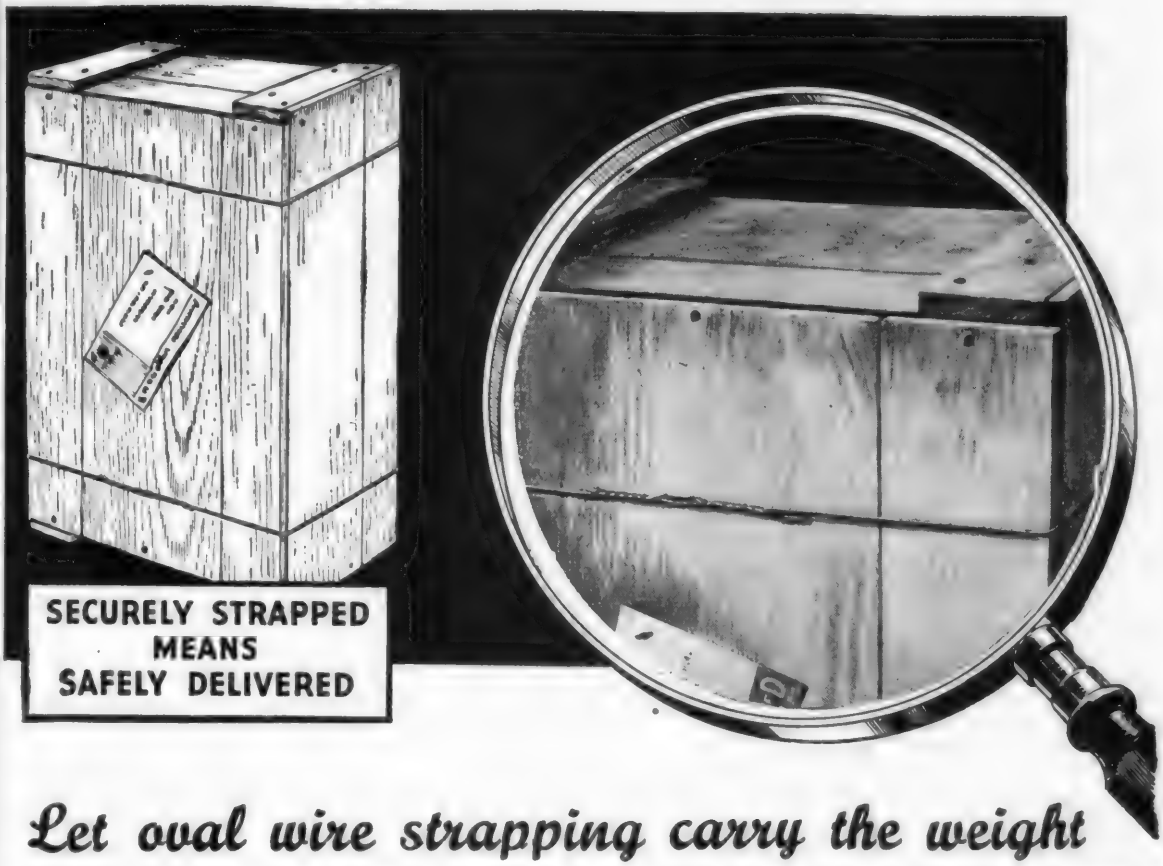
TENSIONAL STEEL STRAPPING



Let oval wire strapping carry the weight

Oval-Tie Strapping is a specially processed OVAL WIRE of high tensile quality applied under considerable tension providing a greatly improved, up-to-date method of securing and reinforcing wooden cases and crates, cartons, bales and packages of every description. It has proved an extremely successful barrier to pilferage, and is widely recognised as the best assurance of SAFE DELIVERY.

Oval-Tie Strapping offers the merits of Round Wire and Flat Band at more economical prices, and is used extensively by Government Departments, Ordnance Depots and firms engaged in every category of production for the war effort.

Particulars of Oval-Tie Strapping will gladly be sent on application.

Oval-tie Strapping is exclusive to:

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Harlequin Avenue, Great West Road,
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FREDK A. POWER & SONS LTD.
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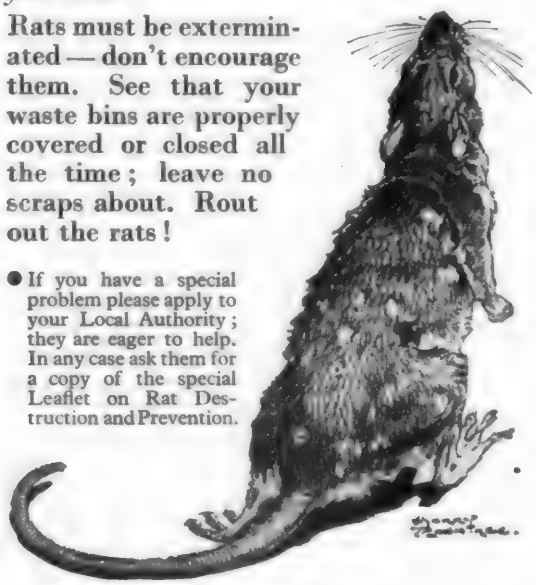
THEY FOUL YOUR PRODUCTS AND STEAL YOUR PROFITS

Rats eat, despoil and gnaw their way through millions of pounds worth of produce every year — the Nation's loss and *your loss!*

Rats must be exterminated — don't encourage them. See that your waste bins are properly covered or closed all the time; leave no scraps about. Rout out the rats!

● If you have a special problem please apply to your Local Authority; they are eager to help. In any case ask them for a copy of the special Leaflet on Rat Destruction and Prevention.



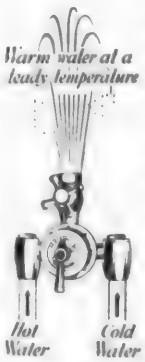
Rout out the Rats!

FREE LEAFLETS—full of concise, helpful hints on the trapping, killing and gassing of rats—are available FROM LOCAL AUTHORITIES

T.2

They hold the temperature steady

Washroom for workers in a factory.



By means of a quick-acting thermostat the Leonard-Thermostatic Valve delivers blended water from hot and cold water and keeps it at a steady temperature, in spite of variations in the supply-pressures or temperatures. If too much cold comes, the thermostat cuts it down and opens up the hot. If too much hot, it cuts that down and opens up the cold. The valve will only deliver water at the temperature for which it has been set. Leonard-Thermostatic Valves save water, save heat, save installation costs. They are used widely for all types of group-washing equipment and process. Leonard-Thermostatic Valves have been adopted as standard equipment by Government Departments, County Councils, Municipalities and Factories all over the country.

Send for pamphlet from the makers.

Specify

Leonard-Thermostatic

hot and cold

WATER MIXING VALVES

WALKER, CROSWELLER & Co. LTD.
CHELTENHAM, GLOS.
and 6 Gordon Sq London W.C.1

61.1018

Glass CONTAINERS

display the product and emphasize its quality

YOUR CUSTOMERS SEE WHAT THEY BUY

★ Food Products have a more tempting appearance and consequently have a better sales appeal when packed in quality glass containers.

★ U.G.B. specialize in the manufacture of glass food containers—the registered trade mark U.G.B. embossed on the base is the "hall-mark" of quality, assuring clear crystal glass of great strength and accurate capacity.

The immense manufacturing resources of the United Glass Bottle Manufacturers Ltd. are sufficient to supply the bottles and glass containers of a most varied description needed throughout the Empire.

UNITED GLASS BOTTLE MANUFACTURERS LTD

Largest Manufacturers of Glass Containers in Europe

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IF you are interested please
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Fredk. BOEHM Ltd.

Rowanhurst, Grove Road, BEACONSFIELD
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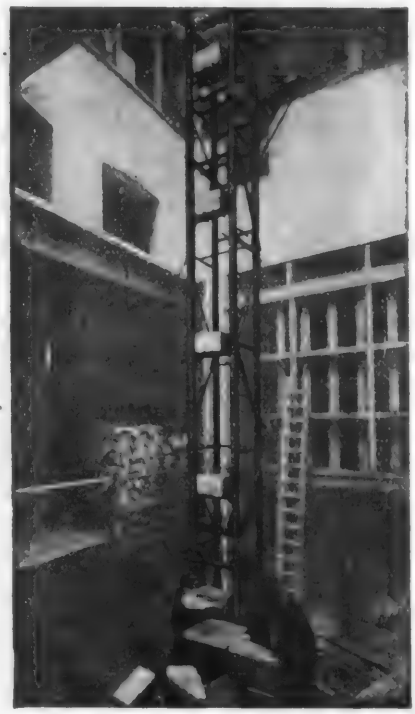

Swing Tray Elevator for Handling Boxes, Sacks, Bales, etc.

Telephone: Gulliver 4418/9
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THE CORRECT STERILISATION OF FOOD PRODUCTS

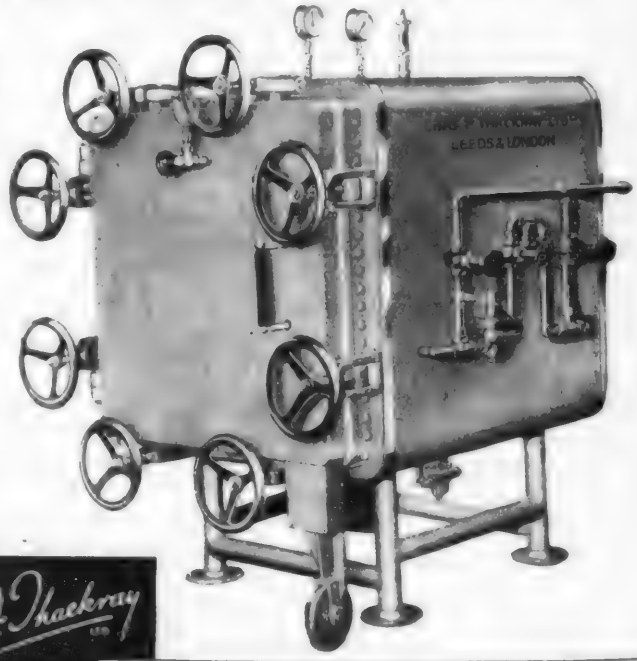
DEPENDABLE, efficient and trouble-free apparatus is a first essential. We have nearly thirty years' practical experience in constructing sterilising apparatus for use in Hospitals, where modern surgical technique demands a high degree of efficiency in the plant used.

The two illustrations show a typical Steam Steriliser as used in Hospitals. With slight modification it is equally suitable for sterilising canned foods. Some of its special features comprise :—

Steam Jacket outside the sterilising chamber, ensuring quicker sterilisation and saving of steam.

Device for creating a vacuum—this gives a correct sterilising temperature.

Automatic control of steam pressure at correct level during sterilising process.

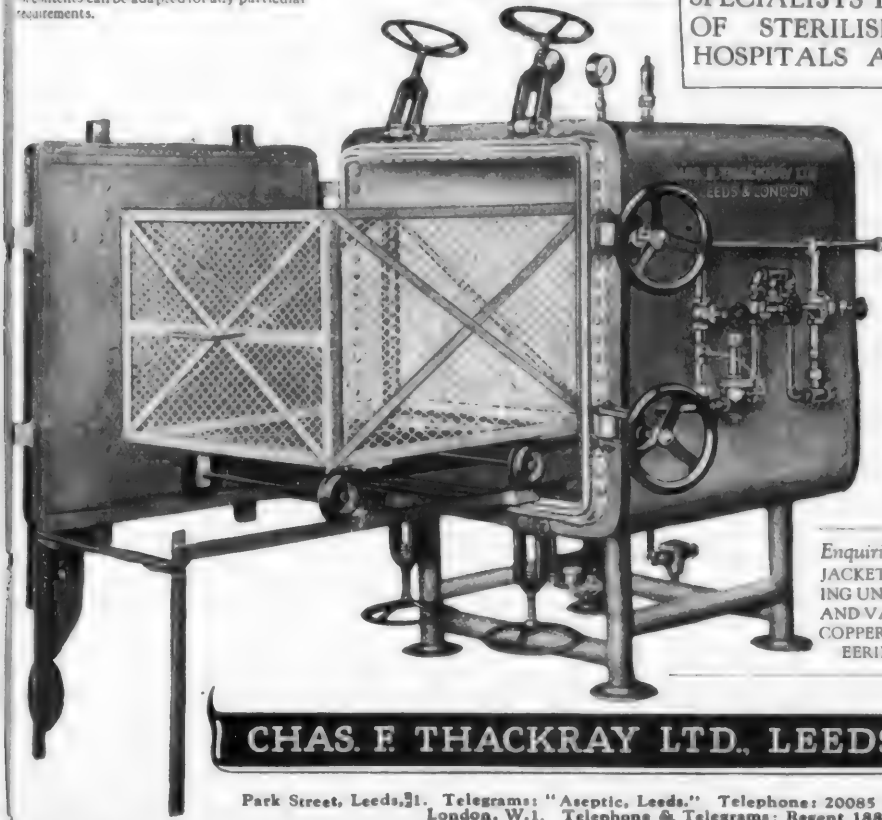


A *Thackray* STERILISING CABINET *adaptable for Canned Foods*

Note the method of supporting the door on a large wheel, permitting it to be pulled open with minimum effort. The shackle bolts have large hand wheels for closing the door steam tight in a rubber gasket. Carriage for contents can be adapted for any particular requirements.

Chas. F. Thackray LTD.

SPECIALISTS IN THE CONSTRUCTION OF STERILISING EQUIPMENT FOR HOSPITALS AND FOOD CANNERIES



Co-operative CONSTRUCTION

We are new-comers in your particular field. Your enquiries will be welcome. Please state your requirements and we will be pleased to submit quotations and technical data, whether you require horizontal or vertical sterilisers, rectangular or circular in shape.

Enquiries also for :
JACKETED VESSELS OF COPPER FOR BOILING UNDER PRESSURE, STEAM PRESSURE AND VACUUM STERILISING APPLIANCES, COPPER VESSELS AND GENERAL ENGINEERING WORK OR LIGHT WELDING.

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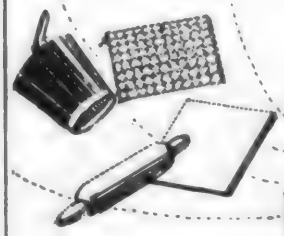
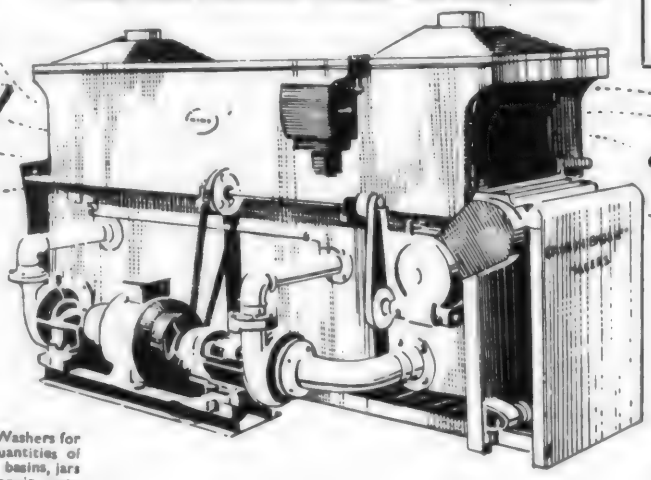
Park Street, Leeds, 1. Telegrams: "Aseptic, Leeds." Telephone: 20085 (3 lines) and 252 Regent Street, London, W.1. Telephone & Telegrams: Regent 1884, London.

DAWSON FOOD UTENSIL AND CONTAINER WASHING MACHINES

JARS · BOTTLES
TINS · BASINS
BOARDS · MOULDS

Every kind of utensil or container used in the factory can be washed in a Dawson Food Utensil Washer.





HIGH-SPEED WASHING OF TINS OR JARS, BASINS OR BOTTLES

Other types of Dawson Food Washers for washing and drying large quantities of tins (biscuit or packed foods), basins, jars or bottles are made. Your enquiry with specimen of articles to be washed and approximate estimate of output per hours will receive prompt attention.

The
GENERAL PURPOSE WASHER

This is the standard type of Dawson General Utensil Cleaner, invaluable in the factory for cleaning boards, basins, moulds, pipes and every article used during manufacturing process.

DAWSON BROS., LTD

Head Office and Works: Ventnor Works, Gomersal, Leeds.
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THEY ARE THE LATEST IN SUPER-CONCENTRATED DRY FLAVOURS EASY TO INCORPORATE IN ALL FLOUR AND STARCH PRODUCTS SUCH AS

CAKE MIXTURES · **EGG POWDERS** · **CUSTARD POWDERS**

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— all maintained with
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THE NATION'S LIGHT
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Perhaps the most important result of B T H Light-Conditioning is its effect upon the spirits of the worker. In preparing plans for the lighting of industrial premises, B T H Engineers give first place to psychological factors, because they know that the kind of lighting that ministers most to the cheerfulness, comfort and well-being of the workers will also have the best effect on production.
Make use of the services of BTH Lighting Engineers. You will be under no obligation.
MAZDA FLUORESCENT Lamps with MAZDALUX Equipment
Five feet of purest daylight
BTH for all Electrical Plant and Equipment
THE BRITISH THOMSON-HOUSTON CO. LTD. CROWN HOUSE, ALDWYCH, LONDON, W.C.2

Mazda Lamps, Mazdalux Equipment of excellent design and the expert advice and planning service of B T H Lighting Engineers are the constituent elements which make B T H Light-Conditioning of such enormous value in increasing the productivity of modern industry.

Write or telephone for a copy of the B T H Light-Conditioning Code. It epitomises the recommendations of the Fifth Report of the Departmental Committee on Lighting in Factories.

M. 3926 *BTH for all Electrical Plant and Equipment*

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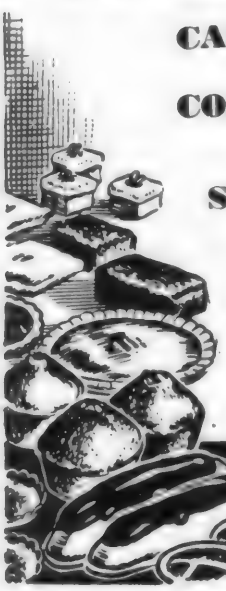
Important TO ALL MANUFACTURING TRADES

Supplies are available.



CARAMITE

The pre-eminent liquid caramel colouring at 2/9 per lb.

COLLOIDAL GLYCERITE

The best thickener for all food products, sauces, soups, coffee essences, etc. Ton lots at 10d. per lb.

SPICERITE

The lowest costing extract for soups, savouries, sandwich spreads, etc. 2/9 per lb.

The prices quoted are for bulk deliveries only, small quantities through wholesalers.

These products are amongst the many Food Manufactures of the famous Ashe Laboratories Limited.

follow* ASHE—*the greatest name in modern food production

ASHE LABORATORIES LTD.

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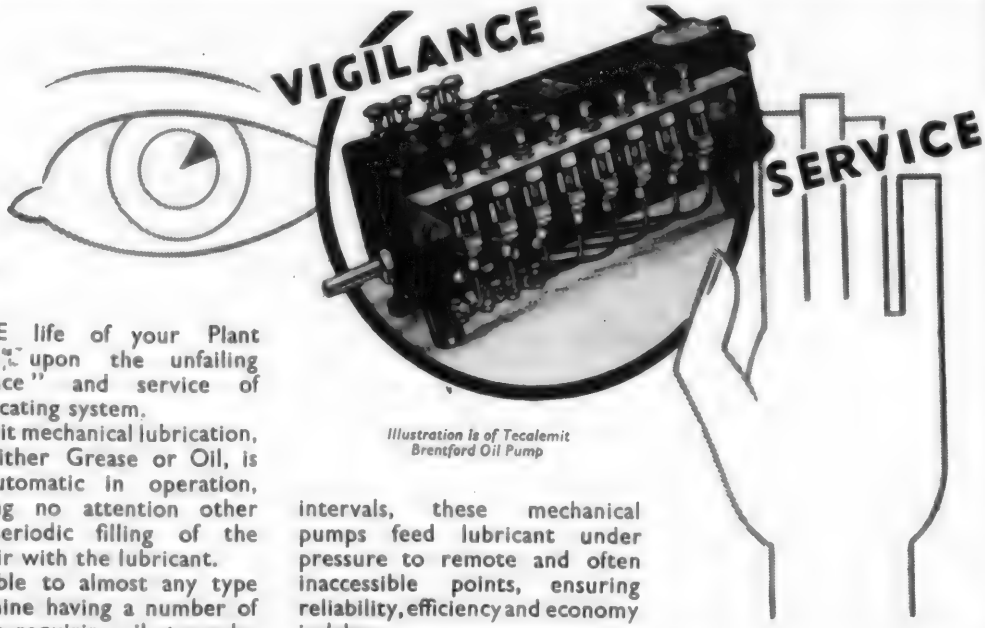
Makers of Fine Food Products since 1935

NEW ERA



THE life of your Plant depends upon the unfailing "vigilance" and service of its lubricating system.

Tecalemit mechanical lubrication, using either Grease or Oil, is fully automatic in operation, requiring no attention other than periodic filling of the reservoir with the lubricant.

Applicable to almost any type of machine having a number of bearings requiring oil at regular intervals, these mechanical pumps feed lubricant under pressure to remote and often inaccessible points, ensuring reliability, efficiency and economy in labour.

Illustration is of Tecalemit Brentford Oil Pump

MECHANICAL LUBRICATION *by* TECALEMIT

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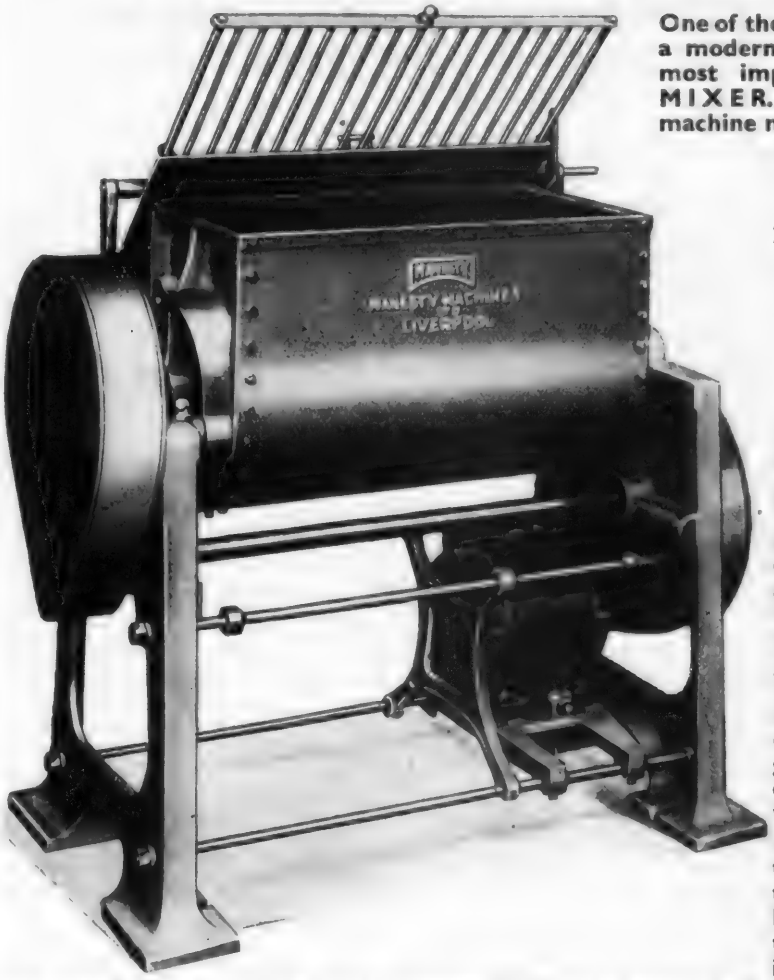
MANESTY

GRANULATING MIXER



One of the most important units of a modern food factory, if not *the* most important, is an efficient MIXER. To be efficient, this machine must be capable of:

1. Mixing ingredients intimately and thoroughly.
2. The mixer must have a sufficiently powerful drive to enable it to manipulate a moistened mass until it has mixed to the right consistency, which in turn will produce the ideal granule.

Without making exaggerated claims, the "Manesty" Granulating Mixer will perform these operations thoroughly and well. In operation it is simplicity itself. The paddle action of the blade gives that necessary "pull" which is needed to incorporate binders, and deal with sticky ingredients which are difficult to mix.

When the mass is ready it is the work of a moment to remove the mass from the mixer as the body can be released and tilted to the right angle for clearing. We have talked of wet granulations only, but the "Manesty" Mixer is equally efficient in handling the dried granules prior to compression.

Lubricants and flavours can be thoroughly mixed in a very short time. Colouring work can be handled by this mixer. It is simple to clean and there are no difficult corners where one material can lodge and escape cleaning and most likely contaminate another batch of different material. It is compact in appearance and the geared direct motor drive is powerful and effective. A special guard allows processes to be observed and solutions added while the machine is in motion. This guard cannot be opened unless the machine is stopped.

Stainless Steel is recommended for general purposes, but where abrasive materials are being used, a gun-metal lining is suitable. In fact, there is a range of metals to suit the particular material.

MANESTY MACHINES LTD.

4a SPEKE HALL ROAD, LIVERPOOL 19

Telegrams: MANESTY, LIVERPOOL — Telephone: GARSTON 1511

GELATINES
OF ALL KINDS

IMPORTERS & DEALERS IN

ALMONDS (Bags & Boxes)	DESICCATED COCOANUT	GLACÉ CHERRIES
WALNUTS	AGAR-AGAR	TARTARIC ACID
BRAZILS (Shelled)	GUM ARABIC	CITRIC ACID
HAZELNUTS	GINGER (Wet & Dry)	FARINA
PEANUTS	COCOA BUTTER	SAGO FLOUR (& Dressed)
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Made in large variety of shapes and sizes. Indents through Merchants and Shippers.

MAKERS ALSO OF FLAN AND TART TRAYS,

Waxed Jelly Cases, Cake Frillings, Plate Papers, etc., for Wholesale and Retail Bakers and Confectioners.

CHEVERTON & LAIDLER,

Manufacturers of Paper Food Containers,

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Keen Agents with Bakery connections (export) wanted. Send fullest particulars and British references.

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ELECTRICAL and MECHANICAL
RELIABILITY plus EFFICIENCY

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Flange type
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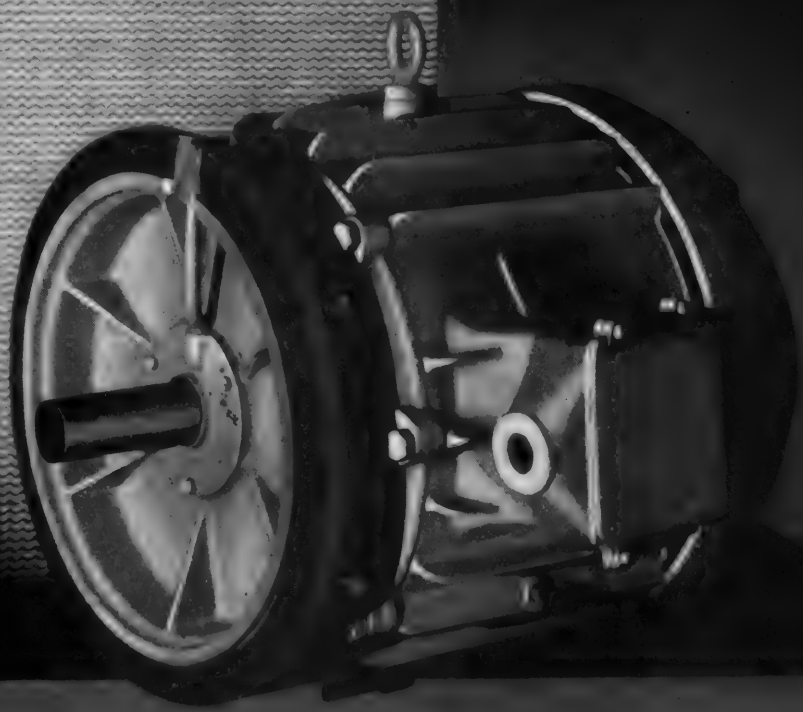

CROMPTON PARKINSON
Limited

BREHMER'S

CONTAINER WIRE-STITCHER, No. 57½

This machine serves for wire stitching the bottoms of single piece corrugated or solid board containers. The pillar type Anvil has 30-in. maximum reach and suffices for firmly fastening the bottom flaps with wire stitches automatically formed, driven and clinched from a reel of Ribbon Stitching Wire 12 by 25 or 12 by 26 gauge. An interchangeable top stitching tongue with adjustable work-table can also be supplied for wire stitching, also the tops of the filled containers in place of taping. Supplied in three styles, viz.: For Treadle use, Line-shaft drive, or self-contained direct motor drive. Speed to 150 stitches per minute.

PARTICULARS OF THIS AND OTHER BRITISH-MADE BREHMER WIRE-STITCHERS on application to:

AUG. BREHMER'S (BRITISH) SUCCESSOR LTD.

Offices:

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Weir Homogenisers

produce thoroughly stable emulsions and prevent separation. Built of stainless materials, easy to clean. Continuous operation fits well into line production.

G. & J. WEIR LTD
AUXILIARY MACHINERY SPECIALISTS
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OTEG

EGG PRESERVATIVE

("Dry-Sealing" Process).

Store every surplus Egg
Don't let a single Egg go stale

DIP them into OTEG (tongs provided), and **STORE DRY IN ANY BOX FOR TEN MONTHS.** They Boil or Whip like new laid.

OTEG seals the shell. Ready for use. No pails of chemicals. Used in thousands of Homes, Hospitals, Hotels, etc., every year.

Tins of **OTEG**, 250 eggs, 3/-; 500, 5/4; 1,000, 8/4. Sold by Chemists, Stores, etc.

Purchase early. Supplies limited.

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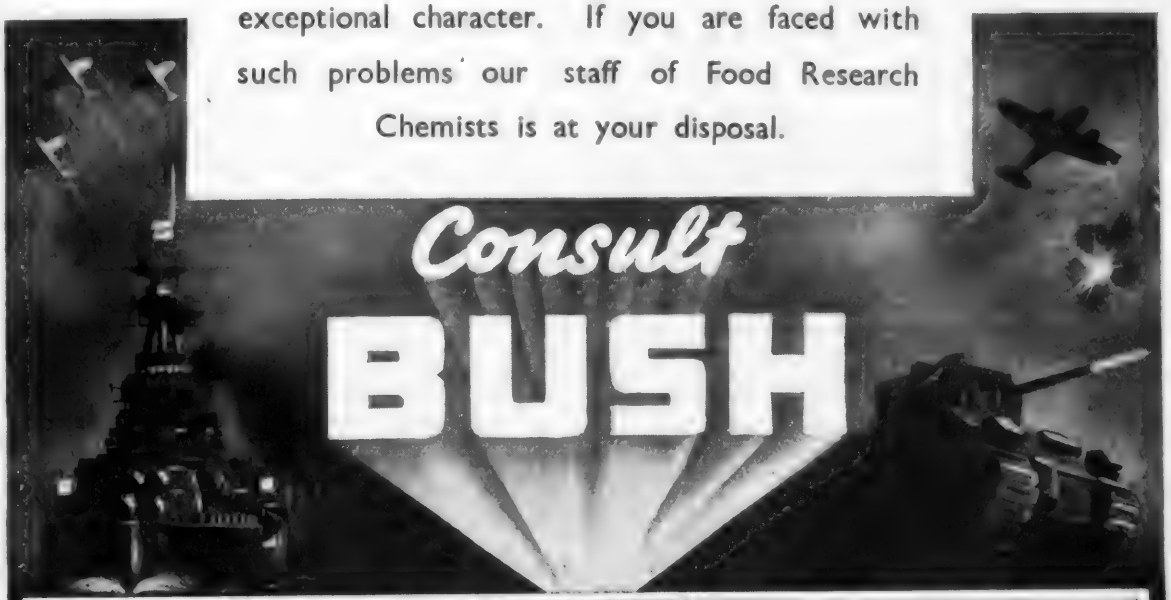
The need for revising formulae in the absence of the usual raw materials presents to the Food Manufacturer flavour problems of an exceptional character. If you are faced with such problems our staff of Food Research Chemists is at your disposal.



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FOOD MANUFACTURE

Vol. XVII. · Published Monthly · March, 1942

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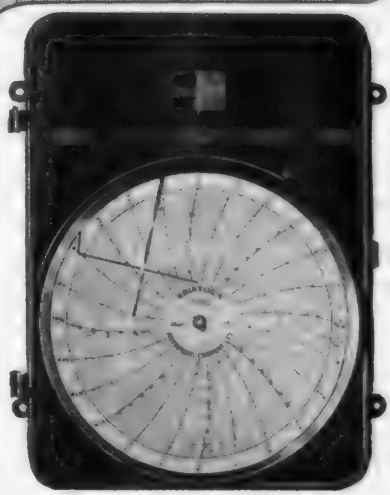

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FOOD MANUFACTURE

Vol. XVII, No. 3 March 1, 1942

A Virtue of Necessity

MAKING a virtue of necessity is a good British attribute never more amply manifested than in these days. Among a host of others, the economy of paper, an important munition of war, is an urgent necessity, and for the second time within two years FOOD MANUFACTURE is faced with it. In June, 1940, we were obliged to reduce the number of its pages and this month ushers in a further modification. We studied several alternatives and our selection from these is embodied in the present issue. The result will speak for itself, but we might mention that we have striven to retain our individuality and, despite slight unavoidable attenuation, our general lay-out, whereby none of the well-known features are omitted. We might possibly point out other virtues but leave the verdict to our readers.

Rye for Bread

In a leading article in which the farm leaflets of the Department of Agriculture of Eire are eulogised, the *Irish Times* said recently that while the leaflets give guidance in the cultivation of wheat, barley, oats and sugar beet, they make no mention of rye, which once was profitably cultivated in Eire and would stand the community in good stead today. The writer points out that wheat, although the best crop in the richness of its product and the toothsomeness of its bread, is the grain most hard to grow with assurance of bounty in the Irish climate. Sure bread is of more consequence than white bread. Rye, after oats—and some experts say before it—is the grain crop best suited to brave the vicissitudes of Irish weather and would be virtually certain of successful harvesting, and if half the area put under wheat were put under rye the risk of a breadless table would be halved. It is pointed out that rich continental nations have delighted to use rye bread in times of peace, and that twice as many people as today were once supported in the island in health, strength and happiness on potatoes, oats and rye. The trouble is that (as is the case with our own national wheatmeal loaf) the people cleave to the white loaf. We all know the cliché "an army marches on its stomach", but it is evident that a people's contentment is connected with that organ, even in the finer qualitative aspects.

A Great Industry

There was a time not so very long ago when food manufacture was not recognised as an industry. It seems only yesterday when we were pretending not to hear those who told us that there were no "food manufacturers" and therefore the need for a journal did not exist. After all, were there not grocery, confectionery, bakery, and milk journals galore? It was even suggested that the word "manufacture" in juxtaposition with food implied sophistication. It is nice to note that the Government now agree with us in the grouping and name, which aroused derision only two decades ago. There will be very few in the industry who will not have noticed the official description of food manufacture in the Schedule of Reserved Occupations issued recently. The choice of title and our faith in the potentialities of the industry have been amply vindicated.

Protein from Green Leaves

Urging that the necessary research should be begun without delay, Mr. N. W. Pirie, in an article on the direct use of leaf protein in human nutrition (*Chemistry and Industry*, **61**, 4, 45), suggests a programme. He states that the two main problems are (1) the maintenance of a supply of leaf material of high nitrogen content during several months of the year, and (2) the design of suitable macerating plant. The amount of research needed on the separation of protein from the leaf sap is probably small, for there is already a large amount of biochemical experience available on the handling of products of this type. It is, for example, already well known that the protein curd can readily be separated from the liquor by heating or adding acid, or even by allowing spontaneous coagulation to proceed. It may be that this research will show that the project is not feasible, but this is unlikely. On the other hand, it may show that it would be well, even in wartime, to divert labour and steel from building and manning ships to building and operating agricultural machinery. There is the third possibility that the project would involve too drastic a change to be undertaken on any scale during wartime but that during post-war reconstruction, with abundant labour and possible shortage of food, it might be useful. In either event the necessary research should be begun now, for much remains to be found out.

Special Dietary Labelling Regulations

They are tackling the question of labelling energetically in the United States. New regulations requiring "label statements concerning dietary properties of food purporting to be or represented for special dietary uses" were promulgated by the Federal Security Administrator on November 18, 1941, to become effective May 18, 1942.

These are the expected regulations under Section 403(j) of the Food, Drug and Cosmetic Act, which provides that a food is misbranded "if it purports to be or is represented for special dietary uses, unless its label bears such information concerning its vitamin, mineral, and other dietary properties as the Administrator determines to be, and by regulations prescribes as, necessary in order fully to inform purchasers as to its value for such uses".

Of particular applicability to the subject of the preceding note is one item of these regulations which is summarised thus:

If the food purports to be or is represented for special dietary use by reason of vitamin or mineral properties, the label must state what amount of each of the vitamins or minerals in question is supplied by a stated quantity of the food. In the case of certain vitamins and minerals for which "minimum daily requirements" are given in the regulations, the amount of the vitamin or mineral is to be given in terms of the proportion of this requirement supplied by a stated quantity of the food. In the case of others the amount is to be given in milligrams. If the special dietary use is for only a certain age group or groups, the proportion supplied of the minimum daily requirement for each group must be stated. If it is for use irrespective of age groups, only the proportion of the minimum daily requirement for adults need be given. If the need in human nutrition for a particular vitamin or mineral in question has not been established, that fact must be stated on the label.

The Reliability of Organoleptic Tests

In the last issue of FOOD MANUFACTURE were quoted two different opinions on the validity of tasting tests. J. W. Crist and H. L. Seaton, while continuing their search for a reasonably reliable method of tasting canned fruits and vegetables, were frankly sceptical of success. In connection with the tasting of fish packs, E. Ferguson Wood found that the members of a tasting panel found difficulty in assigning numerical values.

It is of interest that a panel of five tasters at the Fruit and Vegetable Preservation Research Station, Campden, are said in its annual report for 1940 to have been very successful in agreeing the order of sweetness in canned fruits. The five tasters were accustomed to taste these regularly and were known also to have acute and discriminating palates. Their task was to place the samples in order of sweetness (recording them as first, second, third, etc.) and to comment upon any observed differences in acidity or bitterness. Strictly controlled conditions were used in all the canning experiments, the same sample of fruit being used for each comparative test; the fruit weighed into the cans to the accuracy of 1 gram and the syrup adjusted to the accuracy of 0·2° Brix. For the purpose of comparative tests on artificial sweetening agents the following factors were used for their sweetness compared with sucrose: saccharin 550; soluble saccharin 500; dulcin 250. This, of course, is the only practical and commonly accepted way of comparing these sweeteners with sucrose. It suffers from the fact that the very standards used have been themselves compared experimentally with sucrose.

The Campden annual report contains some very interesting notes on alternative methods of sweetening canned fruits. An abstract is published in this issue.

The Function of the Analyst in Law Cases

An interesting point was recently raised in the course of a prosecution in connection with egg substitute with a misleading label, in which on behalf of the defendant it was submitted that the analyst in his evidence could not enlarge, explain or amplify his certificate. Three High Court decisions were cited to support this submission and the court, having retired to consider this, decided that the Public Analyst could not go beyond his certificate. To those who are accustomed to read accounts of food prosecutions this comes as a surprise, as Public Analysts have been in the habit of making considerable comment on the products in question, apart from giving bare analyses. Whatever may be the legal precedent in this matter, the inability of the analyst to interpret his analytical figures would appear to render decisions more difficult, as, failing the analyst, it remains with laymen to do the interpreting. What with the ignorance of the composition of licensed substitutes imposed upon the analyst and the possibility of this further prohibition, his *rôle* is not a very happy one.

The Accuracy of the Spectrophotometric Determination of Solutions of Vitamin B_1

A note by Dr. Katharine H. Coward, in the 1940 annual report of research work of the College of the Pharmaceutical Society, states that at the request of the Vitamin Sub-committee of the Pharmacopœia Commission, four workers prepared solutions of crystalline vitamin B_1 from different sources, of a concentration of 10 mg. per cent. in N/200 HCl. Parts of these solutions were distributed to all four workers for determination spectrophotometrically to see how far concordant results could be obtained. The four workers were A. L.

Bacharach, J. C. Drummond, S. J. Crewes, and N. Evers. A. E. Gillam was also asked to examine the four solutions. The results were submitted to K. H. Coward for an analysis of the accuracy obtainable in these determinations. Various sources of error were estimated. (1) No information was available by which to estimate the *variation in any one person's readings of a plate at different times*, but it almost certainly exists. (2) *Different workers' readings of the same plate* in one laboratory had a standard deviation of 1·61 per cent., but when twenty-three readings of relatively inexperienced workers were omitted from the calculation, this was reduced to 0·98 per cent. (3) *Variation in dilution of the original solution* had a standard deviation of 0·92 per cent. (4) Variation in concentration of the original solutions had a standard deviation of 2·77 per cent. (5) *Variation due to differences in instruments* had a standard deviation of 3·06 per cent. The "over-all" variation was found to be $\pm 3{\cdot}64$. This is smaller than the figure obtained from the summing of the separate errors, $\sqrt{1{\cdot}61^2+0{\cdot}92^2+2{\cdot}77^2+3{\cdot}06^2}=4{\cdot}52$, but it is probably a fair estimate of the error likely to occur in preparations conforming to the B.P. Standard, for determinations will necessarily be restricted to a few workers using their own instruments every time. The 1 in 100 chance corresponding to this value is 9·38 per cent., or approximately 10 per cent. The table of results was submitted also to Dr. J. O. Irwin, who, by a different method, analysis of variance, arrived at a similar conclusion.

Polarographic Determination of Ascorbic Acid

Polarographic analysis, which is essentially based on current voltage curves in the presence of reducible electrolytes, appears to be finding uses in many fields. Ascorbic acid is a reducible electrolyte, and M. M. Kirk (*Ind. Eng. Chem. Anal.*, 1941, **13**, 625) has used this method for the determination of vitamin C. Her results are only preliminary, as no quantitative determinations were made, but they indicate that the method could be adapted for accurate analysis by comparing the curves obtained, using unknown solutions with those obtained from calibration-solutions containing known amounts of vitamin C. The presence of pigments does not hinder the determination, as the method is specific and sensitive to small amounts of electrolyte. The presence of each compound results in a characteristic rise at a specific voltage with the use of the proper base solution, so that the interference of such substances as cystine and glutathione can be eliminated. In ascorbic acid determinations an acid base solution is used, and this inhibits the production of current rises by these compounds. They can be determined polarographically by using as a base solution an ammoniacal solution of cobaltous chloride in ammonium chloride, as suggested by Brdicka (*Coll. Czech. Chem. Commun.*, 1933, **5**, 112, 148). Very complete discussions of the method have been published by Kolthoff and Lingane (*Chem. Rev.*, 1939, **24**, 1) and by O. H. Muller (*ibid.*, 1939, **24**, 95), and it may well be that other uses will be found in the foodstuff industries for the method when its capabilities are fully recognised by foodstuff chemists.

The Ditton Apple Dip

A simple treatment for improving the keeping qualities of apples of certain varieties in ordinary storage gas has been evolved by the Department of Scientific and Industrial Research. It will be marketed as the "Ditton" apple dip. The treatment consists of dipping the fruit in a liquid that leaves a harmless and almost invisible film on the skin. Two varieties found to respond satisfactorily to the dip, namely, Bramley Seedling and Newton Wonder, will keep for from four to six weeks longer than normal. Wilting and bitter pit were reduced, and in most of the trials rotting and scald were also reduced. Dessert apples have not responded satisfactorily. Treated apples will be useful in commercial growing for filling the gap between the finish of the apples in unrefrigerated storage and the opening of the gas stores.

A Rose by any other Name . . .

The superior attractions of canned salmon, sardines and herrings, during the first days of the introduction of points rationing, appeared to have restricted the sale of American tinned meats, although we understand that they have now established their popularity.

We wondered whether it was a case of "'tis but thy name that is my enemy". The names are certainly short and snappy, but do not suggest anything in particular. They would be easy to remember if there were not so many of them of similar sound—Spam, Trem, Tang, etc. Oliver Twist's memorable request might be useful as a slogan for "Mor", but we were not impressed. Now see what an American contemporary says. Under the heading "Spam Hits the Pot" *The Canner* mentions that "in 1937 Hormel brought out Spam and hit the jackpot. No other canned product has come so close to writing food history in neon lights as Spam has in the last four years . . . the product was not launched when it finally was ready, *for want of the right name*. When it finally was named it simply wrapped up and ran away with a market that almost no one knew existed. It took competitors nearly two years to tool up and bring out rival models". Perhaps we are wrong about the name!

Food Refrigeration

A Symposium

Wartime Refrigeration

IN NORMAL times refrigeration is synonymous with food storage and manufacture, but in wartime it is also serving in many other almost equally important spheres, and it can truthfully be said to be playing a vital part in the present struggle.

At the outbreak of hostilities, like many other industries, refrigerating machinery manufacture was greatly affected, and for a while the outlook was very obscure and uncertain, particularly in view of the very apathetic attitude to the industry of the Ministries. One official was reported as saying, " We won the last war without refrigeration and I don't see why we shouldn't win this one without it." The change-over from peace to war conditions was therefore very slow.

Due, almost entirely in the beginning, to the energy and enterprise of the industry itself and later to the very helpful co-operation of the Ministries—particularly the Air Ministry, M.O.W.B., M.A.P., and Emergency Services Organisation of M.A.P.—refrigeration was successfully applied to many industrial processes, which more than substantiated claims to official recognition as a vital and essential industry to the war effort.

Strangely enough, during the first year of war the food preservation side of refrigeration usage remained very quiet and little commercial plant was installed for this purpose, despite the imperative need and call by the Ministry of Food to preserve supplies and avoid wastage. During this period the industry was in the main engaged with industrial applications, particularly the cold storage of aluminium alloys after heat treatment, to retard age hardening.

After Dunkirk, when invasion became a possibility, and with the development of the various Government schemes of emergency hospitals, ordnance factories, works canteens and communal feeding, cold storage of foodstuffs began to receive somewhat belated attention, the demand being in the main for multi-compartment installations for the main kitchens with service type refrigerators in the dispersal points. During the second year of war a large number of these installations have been made.

The possibility of invasion brought with it a threat to the transport system, and on account of this and air raids it became obvious that dispersal of food storage was just as important as factory dispersal to enable each community or factory to become as far as possible self-contained with sufficient food storage in order that the community be fed and the factory kept in operation during times when transport may be disorganised; also to safeguard against the enemy capturing the total food supply of any particular area in one fell swoop. Incidentally this scheme has also safeguarded against transport breakdowns and delays in bad weather, conditions which could and probably would have meant serious disturbance of food supplies, which, in turn, would directly affect production.

With the introduction of more and larger works canteens the demand for refrigeration is greatly increased, but, in the author's opinion, a very unsatisfactory condition in connection with this is that, whereas the majority of the people responsible for the installation of canteen equipment fully appreciate the necessity for the refrigerator being given careful and expert consideration, there are still cases arising where the refrigerators do not receive this consideration, with the result that cold rooms are specified and ordered with the design temperature unfavourable to the produce available during wartime. In peacetime, when ample supplies of fresh and chilled produce are available, temperatures of the order of 36° F. are suitable, but at the present time, when meat is supplied in a frozen state, lower temperatures are necessary. Furthermore, due to space restrictions, service type refrigerators are installed where walk-in type would give more efficient service. Lastly, refrigerator capacities are out of proportion with the size of the kitchens, forming a severe bottle-neck without reserves and at the same time overloading the refrigerator. It is suggested that the multi-chamber type cold room would be far more satisfactory at the present time as it would enable dairy produce and meat to be segregated and stored at their most suitable conditions, avoiding compromises which are suitable for neither.

In the larger factories the inclusion of a freezer chamber, capable of storing frozen produce for long periods, would also serve a very useful purpose in the event of failure of supplies due to any of the conditions mentioned above.

D. E. HALL.

Self-Refrigerated Meat Shipment

The first shipment from the United States of mild-cured " self-refrigerated " meats—perishable products in ordinary steamer space rather than in customary refrigerated chambers—reached its destination in good condition after many days at sea.

This marks an important development in the shipment of meat products. An ingenious method which makes such shipments possible was devised by resourceful technicians in the meat-packing industry as a means of increasing the flow of high-protein food to England, as desired by the United States Government.

The construction of usual refrigerated chambers of steamers and the providing of refrigerating machinery is both expensive and slow. Usually such chambers are heavily insulated with cork or other material.

In preparing meats for shipment in non-refrigerated space under this new method they were boxed and then frozen, box and all, to extremely low temperatures and quickly placed in steamer holds which had been especially prepared to receive them. Cold from the meat forced the warm air out of the holds. Instead of the usual insulation—expensive, scarce and space-consuming—the ship's bottom and sides were insulated with lard, which also had been boxed and frozen at below zero temperature, the holds being sealed by placing on top of the boxed meats more of the hard-frozen lard. Each box contained two 28-lb. blocks of lard. No refrigerating machinery was employed on the ship, but special methods were developed in connection with the placement of the insulating lard.

Commenting, Geo. A. Schmidt, President of Stahl-Meyer, Inc., New York, and Chairman of the Board of the American Meat Institute, said: "No matter whether or not refrigerator ships are available, the United States will be able to deliver meat to England in good condition. This new method of shipping will ease the effects of any shortage of refrigerated space or release it for the carrying of other products of a perishable nature. This new method of shipping meat may be of great assistance in keeping the people of the United Kingdom well supplied with meat.

"Nutritional science recognises that an adequate diet is of importance in maintaining morale and stamina. One of the most important constituents of such a diet is a plentiful supply, not only of proteins, but also B vitamins. Pork, which made up the shipment, is one of the richest natural sources of B vitamins, especially vitamin B_1, so necessary for good nutrition and for best growth in children."

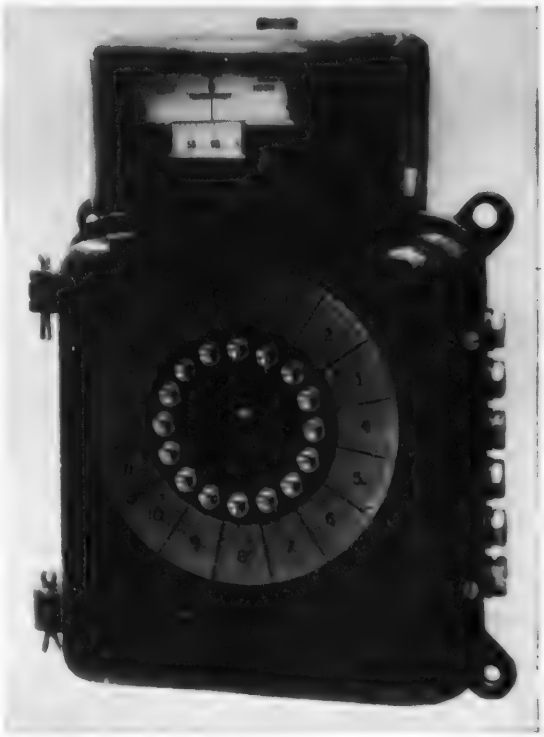
Refrigerated Stores on Board Ship

The successful storage of meat is not a simple matter. Frozen meat and chilled meat are two very different things, and recent developments have greatly altered the technique of storage. Up to quite recent years nearly all our chilled meat—*i.e.*, meat which has been subjected to only comparatively slight refrigeration (between 28° and 30° F.)—came from the Argentine, the journey being sufficiently short to make this possible. The much longer transit time from Australia and New Zealand made it necessary, in preventing deterioration, to freeze the meat at temperatures between 10° and 15° F., resulting in a much inferior quality product. As a result of intensive research it has been found that chilled meat kept under an atmosphere containing up to 10 per cent. of CO_2 will keep sweet and free from moulds or bacterial growth for much longer periods. This has opened up a vast avenue of trade with the Antipodes, with the result that many new refrigerated ships have been built solely for this trade.

In practice, CO_2 is admitted to the holds from steel cylinders or "bottles", and the gases in the hold are then sampled and analysed. It is important that the concentration does not get excessive, as the appearance of the chilled meat would be affected, causing market complaint and reduction in prices. CO_2 indicating equipment has been fitted to ships in the Clan Line, the Commonwealth and Dominions Line (fourteen ships) and the Blue Star Line. Multiple headers are used to sample from the various holds, and a high-vacuum pump is used to draw the gas through the long lengths of piping to the machine-room.

Temperature is supervised by means of electrical distance thermometers. Press-button switchboards and temperature indicators are used in conjunction with tripod and bracket thermometers, in addition to special skewer-type, inserted actually into the carcase of the chilled meat.

Comparatively recently there has been a move towards even more exact temperature control in meat holds, following recommendations from the Low Temperature Research Station at Cambridge. As a result there has been developed a "Null Point" Indicator. The usual Wheatstone's Bridge is used with a slide wire, and, by employing the "three-wire" method of connecting the bridge and galvanometer to the thermometer element, readings may quite easily be obtained with the required exactitude. In the three-wire method, one lead from the galvanometer is taken right up to one terminal of the thermometer element, thus ensuring that the bridge connecting wires from the element are located one in each arm of the bridge. Any change, therefore, in resistance of the leads due to changing temperature will influence both arms alike and will not affect the true reading. Further, as no current is flowing in the galvanometer circuit at the moment of balance when the reading is taken, the possibilities of accurate measurement are greatly increased.



"Null" Temperature Indicator and 16-way Selector Switch.

(*Elliott Brothers (London) Limited.*)

The provision spaces in most of the passenger-carrying steamships are similarly fitted with electrical distance thermometers.

Thermometers are also used for checking the temperatures in the chilled holds of fish trawlers, and it is of interest to note that there have been produced special thermometers so small that they can be inserted into the actual fish to ensure accuracy of supervision.

Two-Stage Ammonia Compressors

In cases where the pressure and temperature in the low pressure side of a refrigerating plant are low or the temperature of the water available for condenser cooling is high, the adoption of compression in two stages merits serious consideration. For instance, with a suction temperature of minus 25° F. and with cooling water at an average temperature, the ammonia gas has

to be compressed to about one-twelfth of its original volume, with the result that, in a single-stage compressor :

(*a*) The volume of gas actually delivered by a compressor of a given size is very considerably less than when less extreme conditions require a reduction in volume to, say, one-fifth or one-sixth.

This is due to the re-expansion of the gas in the clearance space.

(*b*) Inter-cooling, which is possible with a two-stage compressor, cannot be employed to prevent excessive cylinder temperatures, with the resultant danger of carbonisation of lubricating oil and mechanical troubles.

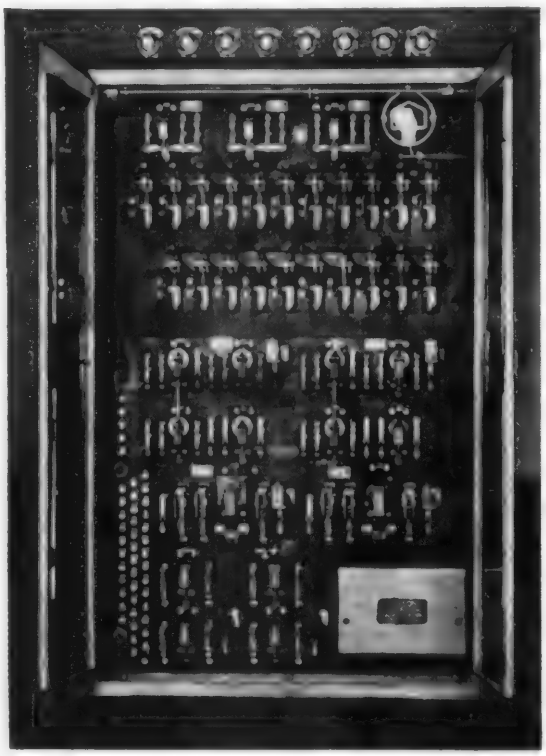
(*c*) Liquid injection at the compressor inlet, or the very wet compression, often employed to prevent such over-heating, only serves to increase the loss of effective capacity already resulting from the abnormal ratio of compression, and also adds the risk of damage to the compressor by liquid hammer.

By using two stages, the ratio of compression in each stage would be reduced, in the case mentioned, to about 1-3½, the actual output increased by about 15 per cent., and the troubles due to heating entirely avoided.

A number of two-stage compressors for refrigerating and converted existing machines have been supplied by Peter Brotherhood, Ltd., with satisfactory results.

Automatic Control of Refrigerating Plant

Automatic control is applied to refrigerating and cold storage plant to fulfil three functions—first, and of primary importance, to maintain the desired conditions in the storage space; second, to govern the running time of the plant in the interest of economy; and third, to safeguard the equipment in the event of abnormal conditions developing. All three functions are closely inter-related, and in large installations call for a fairly complex control system with a large amount of automatic apparatus.



The illustration shows a large automatic control panel supplied by The British Thermostat Co., Ltd., Sunbury-on-Thames, who, in addition to manufacturing individual pieces of control equipment such as thermostats, pressure controls, expansion valves, etc., undertake to prepare complete schemes for the automatic control of installations of any magnitude and to supply all the necessary control apparatus mounted upon a panel together with the requisite electrical switch gear.

The panel controls a large cold store and provides complete automatic control and full protection, with alternative manual control for an installation comprising two ammonia compressors, three evaporators, three cold room fans and two brine tanks.

The automatic controls are standard " Teddington " instruments and include a two-circuit thermostat in each cold room, a solenoid ammonia valve for each evaporator, a motorised valve controlling the flow of cooling water, a safety switch to shut down the plant in the event of water failure, and an excess pressure cut-out which also shuts down the plant in the event of abnormal pressure being developed on the high pressure side of the compressor plant.

These controls operate the necessary contactor and starter gear for the compressor, fan and pump motors, and the whole of the switch gear is mounted on the panel together with the alternative hand control switches.

Refrigeration Control in Works Canteen

An installation in a large works canteen, the capacity of which is 3,000 meals per sitting, comprises four departments with separate automatic refrigeration control. The departments are known as the freezer room, the chiller room, the provision room and the cellar, their total capacity amounting to no less than 4,000 cubic feet. Each serves a different purpose.

The freezer room, of 560 cubic feet, is designed to accommodate frozen meat, and by means of a condensing unit rated at 1 h.p. its temperature can be confined to between 28° and 30° F. for long periods with little cost for current.

The chiller room is 50 per cent. larger than the freezer room, its capacity being 840 cubic feet. Maintained at a temperature of 34° to 36° F. it serves for the storage of chilled meats available for immediate use in the canteen kitchens.

The provision room is set aside for stocks of foodstuffs that need to be preserved at a definite temperature to ensure the retention of their freshness and nutritive values—butter, milk, ham, salads, etc., figuring in this category. To this end the refrigerating unit is set to keep the temperature within the limits of 40° to 44° F. The capacity of the room is 600 cubic feet.

The cellar is as large as all the other rooms combined, its capacity totalling 2,000 cubic feet. Temperature is restricted to the region of 44° to 48° F. Tinned goods, vegetables, fruit and cereals are stocked in this cellar.

The four rooms comprising this installation were specially constructed to prevent air leakage and its consequent effect on temperature maintenance, and

they are lined in accordance with modern hygienic principles. The rooms are equipped with fans for internal air circulation, and with bulkhead lighting fittings, in addition to the refrigeration units—supplied by Messrs. Coldair, Ltd. The units referred to are of the twin cylinder condensing type, from a standard range; three of them are 1 h.p. size and the fourth ¾ h.p.

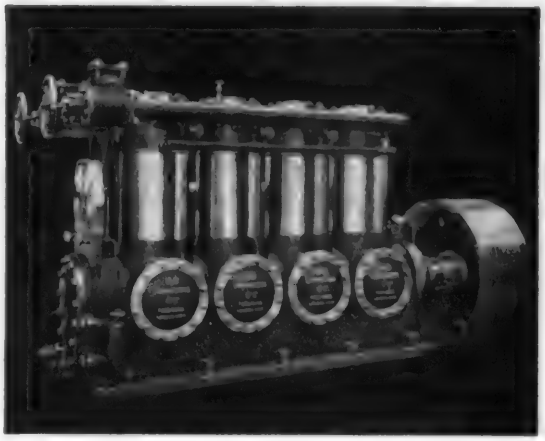
Fruit Stores

Probably the most far-reaching of the remarkable developments which have taken place during recent years in the storage and preservation of foodstuffs has been the discovery of the beneficent results of an atmosphere of CO_2 in retarding the ripening of fruit.

It is necessary to recognise the fact that all fruits are living organisms. An apple respires throughout its life, absorbing oxygen from the atmosphere and giving out carbon dioxide and water vapour. Ripening can be retarded and the life of the apple prolonged after removal from the tree either by storing at a low temperature or by storing in an atmosphere deficient in oxygen and containing a considerable quantity of CO_2. Cold storage alone has achieved a considerable measure of success, and nothing further is needed for certain varieties of apples. There are, however, numerous varieties which cannot be held in ordinary cold storage for the necessary period of time unless a temperature lower than 37° F. is maintained in the store. This temperature, unfortunately, is so low as to cause damage to the tissues of these more sensitive varieties, and the fruit collapses very soon after removal from the store. No damage occurs at higher temperatures, but the time during which storage is possible is too short for market requirements. The atmosphere, consisting of 79 per cent. nitrogen and 21 per cent. oxygen, if apples such as Bramley Seedlings are kept in a gastight store and are allowed to convert about half the oxygen present into CO_2, they can be kept at a temperature of 41° F. for as long as twelve months in perfectly sound condition. The proportion of CO_2 has to be carefully regulated to avoid "brown heart". The most recent developments go even further by the independent adjustment of the constituents of the atmosphere in the store—*i.e.*, CO_2, oxygen and nitrogen. Suitable indicating instruments for measuring the percentage of both CO_2 and oxygen are available.

The illustration shows the complete equipment for fruit farms. It forms a complete indicating outfit with all interconnections, both gas and electrical, already made. It is usual for the sampling pipes for the various gas stores to be brought to a common header fitted with cocks so that a sample can be drawn from any particular store at will. Where a large number of stores are to be dealt with and where the pipelines are of considerable length, it is necessary for speed of operation to clear the pipe of gas quickly so that the new sample may reach the analysing unit with as little delay as possible. This is done by using two aspirators, one for drawing the sample through the instrument, and the other, called the pumping aspirator, which is much more powerful and is capable of clearing a line of pipe in a few seconds. In practice it is usual by means of a double header and cocks to draw gas into each pipeline in turn with first the pumping aspirator and then the sampling aspirator.

With fewer and smaller stores it is not necessary to have the pumping aspirator.



Vertical Ammonia Type Compressors

The predominating type of "Udec" Compressor in the illustration is the vertical ammonia type made in a wide range of capacities. These compressors are totally enclosed, single-acting, uniflow type, designed to meet present-day requirements for compressors which can be operated on the highly efficient dry-compression system.

A unique feature of "Udec" machines is the rotary crank-shaft gland of the packless type working in oil circulated under a pressure above that of the crankcase, providing a positive seal and, under working conditions, requires no adjustment. All bearings and working parts are continuously supplied with filtered oil under pressure through a positive-acting valveless submerged gear-pump in the bottom of the crankcase. All stop valves have renewable seats of the double-seated type, allowing glands to be repacked whilst valves are under pressure.

All main valves and gauges, etc., are conveniently arranged at one end of machine in a compact and convenient method for easy operation.

Ozoniser for Small Cold Storage Chambers

Of recent years ozone has been extensively used in many directions, such as the sterilisation of drinking water and water in swimming-baths, deodorising of sewage works, abattoirs, etc., and in air conditioning and purification for hospitals and theatres. A further field in which ozone has proved to be extremely beneficial is in connection with cold-storage chambers, either on board ship or on land.

Ozone, owing to its remarkable oxidising properties, will effect complete deodorisation of cold-storage chambers and maintain the air in a fresh condition, thus enabling different types of food to be stored in the same place without fear of the one article contaminating the other. It has also been proved that, with the addition of ozone to the atmosphere of a cold-storage chamber, foods can be maintained in better condition and for longer periods.

Ozone is produced commercially by subjecting the oxygen in the atmosphere to a high-voltage silent electrical discharge between two electrodes and a special di-electric. It is only necessary to connect an ozone generator to an A.C. light point, and the transformer supplied with the apparatus steps up the voltage to the required potential.

The manufacturers of the "S.A." Ozonisers, Bruce H. Auld and Co., Ltd. (branch of the Visco Engineering Co., Ltd.), have recently introduced a compact portable model for use in small cold-storage chambers which should have a very wide field of usefulness. This unit, which is suitable for the average small cold-storage chamber, is enclosed in a stoved enamelled steel case, and is of very robust construction. The current consumption is extremely low, the maximum for the type illustrated being 10 watts. A unit of this type will be suitable for dealing effectively with a room of 500 cubic feet capacity.

Other types are manufactured for dealing with large cold stores; these can be either of the portable or fixed type, according to requirements.

Australia Official Handbook

In answer to the ever-increasing flow of enquiries from overseas concerning the continent of Australia, its resources and its people, the Australian National Publicity Association has issued this official handbook. Although not claimed to be a complete survey, within its pages will be found a sufficiently comprehensive story to indicate the remarkable progress made in little more than 150 years of white settlement, and to suggest an infinitely greater future.

Replete with coloured maps and photographs comprising many phases of Australian life and activity—from wonderful landscapes and weird fauna to munition making and shipbuilding, the handbook is excellently set out for easy reference. Geography, history, government, social conditions, culture, land settlement, manufacturing industries and many other subjects are adequately treated.

In the direction of food production, the factories are occupied not only in producing goods for home consumption but for the export market. The latter group includes factories annually producing butter, cheese and condensed milk valued at £33,000,000; jam and fruit preserves valued at £7,230,000; flour valued at nearly £13,000,000; confectionery valued at £7,100,000; and sugar valued at £12,200,000.

A useful Appendix gives details of travel services to and within Australia.

Must Disclose Scrap Metal

The Minister of Works has been given powers, under a new Defence Regulation, to make an Order calling upon owners and occupiers of specified categories of premises to disclose any metal suitable for scrap which is on those premises at a specified date.

An Order is now being drafted which will provide for compulsory returns to be made of all disused machinery, plant and other types of unwanted metal. The terms of the Order will necessarily be widely drawn, but the Minister wishes to make it clear that there is no intention to take for scrap valuable machinery and plant which must be preserved for use after the war.

In particular, machinery and plant belonging to firms that have closed down under concentration schemes approved by the Board of Trade will not be requisitioned, nor will a return from these firms be requested.

"Food Manufacture" 1941 Index

As it will not be possible to bind the January and February numbers of Food Manufacture with the rest of the 1942 volume owing to the change of size starting with the March number, the index for 1941 will include the January and February numbers. It is suggested that those who wish to bind Food Manufacture will include these numbers in the 1941 volume.

By reason of the inclusion of the first two 1942 numbers in the 1941 index, its preparation has been delayed a little, but it will soon be ready, and copies will be available to subscribers on receipt of a stamped addressed envelope, preferably of a size which will permit of the index to be sent without folding.

Canning and the Far Eastern Situation

SPECIALLY CONTRIBUTED.

THE entry of Japan into the war and the unfortunate, if only temporary, loss of the Malayan tin supply is likely to have far-reaching effects on the British canning industry. The fact that trouble in the Far East has been more or less expected for some time past, together with the universally acknowledged importance of canned foods as a strategic weapon, encourage the hope that the Ministry concerned with ensuring our wants of tin has useful quantities of the metal in this country. It is true to say that the fate of our canning industry between now and the end of the war may depend very largely on the size of these stocks. But be they large or small, it is essential in the national interest that they be used with utmost care, and economies of a kind never even dreamed of in times of peace may now be forced upon us. How may such economies be effected?

The Function of Tin

Tin performs two primary functions in the container for canned foods, the first and more obvious one being that of protection. The tin coating is not absolutely continuous, and bare spots of iron can readily be demonstrated by the ferricyanide test on the most perfect-looking of specimens. To these inherent defects must be added the numerous chafings and breaks in the tin film, caused by handling during the period in which the sheets are being transported to the can-maker, cut up, made into cans, filled, sealed and processed. By reversing the polarity of the iron with respect to itself, the tin prevents, or at any rate retards for a long time, the much more vulnerable iron from being attacked, and hence protects the product from spoilage and the exterior of the can from rusting.

The second and perhaps not quite so well-known function is that of an indispensable aid in the production of satisfactorily soldered side seams. Application of solder to plain iron or steel surfaces is by no means an easy matter. In order to make a good joint it is usual to flux thoroughly with zinc chloride and hydrochloric acid, apply a coating of fairly pure tin, then solder in the usual way. In other words, the tinsmith first converts a small area of his plain iron surface into tinplate.

Possible Economies

For many years, both in this country and America, 1·5 lbs. tin per basic box (equivalent to about 12 mgms. per square inch of surface) has been the recognised standard for tinplate of the quality employed in the canning industry. The first question which prompts itself when economies are being considered is: By how much can this amount be reduced?

An interesting comment on the question was made by a contributor to FOOD MANUFACTURE as recently as December last (p. 275). Referring to the efforts made in America to economise in the use of tin, the writer says: "This has led to the use of a thinner tin coating on tinplate, and 1·35 lbs. per basic box is now extensively used in place of 1·5 lbs. The thinner coating has not simplified the can-maker's problems, particularly in the soldering of the side seams, nor is it clear how far the thinner coating may affect the keeping qualities of certain packs."

While the weight of tin in any given box of tinplate may be near enough to 1·5 lbs. basis, the film itself may vary by as much as 20 per cent. from sheet to sheet, or even in different parts of the same sheet. It is doubtful whether anyone has ever proved that this variation is reflected in the soldering operation. The writer quoted above does seem to imply that a reduction of 10 per cent. in the tin content makes soldering more difficult and the result more uncertain. One cannot help wondering whether any real evidence in support of this statement is forthcoming. Certainly the task of obtaining such evidence is attended by almost insuperable difficulties. Visual inspection of empty cans as they come from the plant is likely to be misleading rather than helpful, partly because such a very small proportion of the total output can be examined in this way, and partly because even the most practised eye can only detect relatively gross defects. The real test is a statistical one. It would require a detailed examination of all blown cans made from the tinplate over a fairly long period, and a computation of the percentage of spoilage due to faulty soldering compared with similar data for cans made with the heavier tin coating.

Untinned Steelplate

Relatively speaking, a saving of 10 per cent. of tin is neither here nor there, and would simply have the effect of making each year's allocation of tin for tinplate last about thirteen months. To be of any real value in the present situation something far more drastic must be considered. Well, the most drastic step that can be taken is that of dispensing with the tin coating entirely. Can it be done? A hint to the effect that the answer may soon be "Yes" is to be found in last November's issue of FOOD MANUFACTURE (p. 265), where the satisfactory development of a new process for making corrosion-resisting steel is reported. This is very encouraging, and further news will be awaited eagerly; but until such steel is available in quantity the question must be answered in relation not only to the materials and equipment at hand, but to the product going into the cans.

Any plan envisaging untinned plate must have due regard to two important factors—namely, (1) cans made of such plate must be lacquered inside and out to prevent spoilage and corrosion; (2) existing high-speed body-forming machines will not solder untinned plate. This does not rule out tinless plate entirely. The lacquering presents no real difficulties, and, provided the operation is performed after the cans are made, complete and adequate protection is secured. The kind of lacquer is obviously a matter of some moment here, but lacquers which will stand up to all ordinary conditions of retorting when applied to untinned plate have

been available for some years. The soldering of the side seam is a much tougher proposition which has not yet been satisfactorily solved, as far as is known to the author. It would not be surprising if the present crisis provided the necessary stimulus to those engaged on the problem.

In the event of untinned plate proving recalcitrant, and bearing in mind what has been said about the advisability of suitable lacquers, it remains to determine the absolute minimum of tin which, when applied as a coating, will enable can-makers to produce satisfactory cans in existing plant, without reduction in speed. Who knows but that a reduction to 0·5 lb. tin per basic box might not be achieved, and the potential value of our allocations thereby increased threefold?

Possible Economies in the Use of Cans

For the purpose of this discussion it is proposed to divide commodities normally packed in tinplate containers into three groups. These are:

(1) Dry products such as cocoa, cereals, milk powder, coffee, biscuits, etc.
(2) Fruit.
(3) Meat products, including soups, fish and vegetables, milk.

Manufacturers of the first group of products have been obliged for some time to find containers of materials other than tinplate for their products. Many have found temporary relief in paper or cardboard cartons, but if the present salvage drive is any indication of our resources, it would appear that paper is in even greater relative demand than iron and steel. Moreover, his commitments in relation to his rations of raw materials are such that the carton-maker is reluctant to accept new business.

There would appear to be no reason why dry products such as those included in this group could not be packed in lacquered, untinned, iron containers. The difficulty of the side seam does not arise, as it is not soldered, and lacquer could be applied to the original plates, as post-lacquering would be unnecessary. Such a policy would mean that the consumer would again receive his cocoa or "night-cap" in the familiar "tin"; the manufacturer could revert to his pre-war set-ups, for which he was, and probably still is, adequately equipped. And the empty container would still become scrap metal in the end, but without waste of precious tin or the complication of de-tinning.

Canned Fruits

The second group—canned fruits—appears to offer greatest scope for saving both in tin and iron. The simplest and in many ways, from a national point of view, the most economical action would be to convert much more fruit into jam. It will probably be argued that a certain amount of fruit preserved in light syrup is justified as a means of adding variety to our already restricted diet; let this point be granted.

The fact that fruit is an acid product obviates the necessity for sterilising temperatures in excess of about 190° F. Even the heat-resisting spores of *Byssochlamus fulva* are killed with certainty at this point if the precautions worked out at the Campden Research Station are taken. This prompts the suggestion that during the present emergency cans for fruit might be replaced either entirely or in part by jam jars.

In view of the difficulties they experienced in obtaining jars for the 1941 season's pack, the reaction of the jam manufacturers to such a suggestion can well be imagined. But this is war, and drastic action is called for. The suggestion would require quite minor changes in technique on the part of the canner; it would require nothing new or revolutionary in closures, because there are plenty of excellent ones already on the market; the new pack would at least equal the old in appearance; the jar, when empty, could be re-used; most important, large quantities of tinplate and lacquer would be saved.

Jam Manufacturers' Requirement

It remains to satisfy the jam manufacturers' requirements of jars for the approaching season. Where will they come from? Some part of the total number required will already have been made by the jar-maker during the close season, and there is still four months left in which more can be made before they are required in large numbers. For the majority, however, it is suggested that the fruit preserver should go to the housewife, who is brought into this scheme of things with some reluctance on the author's part. But look at it this way: Every day throughout the length and breadth of Great Britain millions of milk bottles full of milk are delivered to millions of doorsteps. Every night these same milk bottles, empty and usually washed, are put out for the milkman to collect. The task is as much a part of the nightly ritual as is taking the dog for a walk. It may be suggested that the housewife has been gradually educated up to this over a period of years, so let be recalled a more recent order prohibiting shopkeepers from wrapping bread sold over the counter. The housewife responded instantly to this measure by taking wrapping material with her when she went shopping. Similarly, she would respond with empty jam jars if she were asked in a way which leaves no doubt in her mind as to the necessity of the measure. As an extreme measure an order could be made whereby a consumer would only receive full jars in exchange for a corresponding number of empties; but such a course need never be necessary. One word about collecting. Local authorities and second-hand bottle merchants would help if requested, but, properly organised by the manufacturer, large supplies could be obtained through the medium of schools, Boy Scouts and other voluntary organisations. Success, however, demands immediate action.

Canned Meats and Vegetables

The third group, comprising canned meat and vegetables, appears to offer least opportunity. In general these products are neutral in reaction, require temperatures above that of boiling water for sterilisation, and might prove a potential source of danger. Any changes in the containers for these products could only be justified on the basis of irrefutable experimental evidence. The question is: Has such evidence been obtained? If not, the most that can be hoped for is economies in other directions sufficient to enable the members of this group to remain unaffected. One point does occur in connection with carrots. Last year vast quantities of this vegetable were canned. If similar quantities are visualised again this year, it is suggested that the entire

pack should be diced. Whole carrots and large slices are less economical from the point of view of net weight of vegetable per can. Incidentally, gardeners and allotment holders, who are in the habit of storing their annual crops in clamps, wonder why carrots need to be canned at all.

Under the heading of possible economies in the uses of cans, reference must be made to the quantities of jam being made for the Forces. Since the outbreak of war many thousands of tons have been supplied to the War Department, the majority packed in 7-lb. double-seamed cans which automatically become scrap when empty. The suggestion is put forward here that such quantities as are required for use in this country should be packed into 28-lb. cans with slip-on lids. In times of peace astonishingly large amounts of jam are packed in this way for the confectionery trade, and the empty cans are subsequently returned to the manufacturer, washed, and re-used. Such a recommendation put into effect would produce no hardship for the jam manufacturer, would be just as good for the user, and would result in a very substantial annual saving of tinplate.

To Users of Tinplate and Cans

In conclusion, a word to all makers and users of tinplate and cans. It is imperative that every man and woman whose daily task brings him or her into contact with tinplate shall strain every nerve and sinew in an effort to avoid waste of this now most precious commodity. Maintenance engineers, for example, must be absolutely certain that the machines under their care are in perfect condition. Just remember that an empty oil-bottle ultimately results in some part of the plant seizing up, and during the approach to this hundreds of defective cans may be produced which subsequently become " blown ", and thus a dead loss to the nation. Foremen, forewomen and all others in positions of authority must ask themselves : " How can I prevent waste?" The answer will not be hard to find. It should be acted upon.

Doughnuts by the Million

To pay £1,000 a month rental for premises in which to sell nothing but doughnuts sounds fantastic. But facts are stranger than fiction. That is the rent paid by a doughnut concern for a shop in Times Square, New York. Still more surprising—the shop showed a profit from the day it was opened.

The making of doughnuts as " Big Business " recently came of age. Expansion during those 21 years is a chapter in commercial baking that is paralleled in America by the growth of only one other industry producing food—the " hot dogs " which years ago became conspicuous over the greater part of the United States.

The old-fashioned way of making doughnuts was interesting to spectators; it was also hot, smelly and slow. The fumes coming from one American bakery became objectionable, and had to be drawn off in an air duct; this duct also served a cinema next door. The duct leaked and patrons complained at having doughnut odours mixed with their drama.

The head of that business, a Mr. Levitt, was tempted to give up the making of doughnuts, but after witnessing the popularity of his product he concluded that he had only scratched the surface of the potential doughnut market.

The Problem of the Right Machine

What followed is typically American. One night on a train going to Philadelphia Mr. Levitt hinted at his problem while talking to a fellow-passenger. " I think I can help you ", the stranger volunteered. " My company makes machinery for bakeries. I believe we can make a machine that will manufacture doughnuts. It would take care of the mixes and everything. Do you want us to try?" An order was given on the spot.

After eleven failures a twelfth was set up. Pleased with the success of the machine, and confident that the doughnut had a great future, Mr. Levitt sold his bakery, devoting his energies to the making of machines for other bakers.

Problems arose. The machines efficiently standardised the method of making the doughnut, but up to that time nothing had been done to standardise the mix that went into the hoppers. The necessity for such a mix became clear. Machines clogged on some of the mixtures poured into them. Worse still, not all mixes were good to begin with.

Other important steps—development, distribution and acceptance of a standard mix that would work equally well in all machines and that would produce better doughnuts—had to be taken if the doughnut industry was to proceed satisfactorily.

Doughnuts as a Great Industry

A flour mill was bought on a site where the first mill of that kind was built in the United States. Wheat, milk and eggs that would suit the purpose were contracted for, and after repeated trials and failures a mix was obtained that met requirements. The baker had only to add water, stir, and then pour the dough into the hopper of the machine.

Then came the birth of the Doughnut Corporation, now having 2,000 employees, which makes the machines, the mixers, and the finished article. Although the fancy doughnut is made in all its glory, the plain, sugared and chocolate-covered kinds are the biggest sellers.

Recently mixes with added vitamins were introduced to keep pace with the vitamin movement throughout the States and to make the doughnut still more important as a food. Tests have demonstrated the nutritious qualities of these machine-made products, and proofs of their digestibility have been offered to the medical profession.

In the Corporation's largest producing centres doughnuts are made at the rate of 1,400 dozen an hour. The dough is squeezed by air-pressure through nozzles which cut it into rings. The circlets swim along a bath of vegetable fat electrically heated. They are then turned over to dry on the other side, after which they go out on a conveyor to the cooling cabinets. In less than an hour, from the mix to the finished doughnut, they are ready for the retailers' counters.

Carotene as Provitamin A

Butter, margarine, milk and other rationed foods provide about one-quarter to one-half the daily requirement of vitamin A, leaving 2,000 I.U. to be obtained from other sources. Britain's carrot crop alone—if shared equally—would just cover this. The sources, concentration in common foods, methods of estimation and other aspects of carotene are discussed in this article.

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MAN obtains his supply of vitamin A in two main forms. The one, vitamin A itself, occurs only in animal food, principally liver, milk, fish and eggs. The other, carotene, is of vegetable origin, and is the source from which the animal makes its vitamin A.

The Carotenoids

The yellow pigments known as carotenoids occur abundantly in carrots, grass and green leafy plants. The group includes the carotenes, which are unsaturated hydrocarbons, and which have vitamin A activity, β-carotene being the commonest and the most active. Because carotenes are converted into vitamin A in the animal body they are sometimes called provitamin A. Strictly speaking, any substance having vitamin A activity comes within the biological definition of vitamin A, and carotenes, together with certain of the less common hydroxylated carotenoids having the vitamin activity, are frequently so classed. To avoid the resulting confusion it has been suggested that the term vitamin A should embrace the whole group and that the animal product—to which the term is frequently restricted—should be called axerophthol (pronounced ay'-zeer-op'thol. Other suggested names include carotenol).

Axerophthol is an alcohol derived from half the molecule of carotene, though homologues having vitamin activity are also known. Because carotene is a better name for an unsaturated hydrocarbon than carotin the latter spelling has now been dropped. For further details of their chemistry the reader may consult the article "Carotenoids," by R. A. Morton (1940, *Chemistry and Industry*, **50**, 301), or the book *Leaf Xanthophylls*, by H. H. Strain (published by Carnegie Institution of Washington, 1938).

In this article "carotene" may usually be assumed to include any carotenoid having vitamin A activity, most of which will in general be β-carotene. Inactive carotenoids will be referred to as "xanthophylls". This approximation is made for convenience, because although several other carotenoids of the xanthophyll type behave as the provitamin, they have not been reported in appreciable amounts in common foods.

Vitamin A—including carotene—is measured in International Units. The unit is defined as equal to 0·6 microgram (μg. or γ) pure β-carotene. The exact weight of axerophthol in one unit is not yet known, but there is good evidence that, weight for weight, axerophthol has about twice the activity of β-carotene. As the vitamin A values of vegetables are not always exactly proportional to their carotene contents it might be advisable to restrict the use of the I.U. to indicate the biological value or vitamin activity and to express the carotene, when determined chemically, as μg. per 100 g.

Chemical Estimation of Carotene

In the chemical methods the estimation is done in three stages: (1) Extracting the pigment into a suitable solvent; (2) removing other pigments; and (3) determining the carotene by its selective absorption of light.

Carotene is soluble in most fat solvents, but with many of them is only extracted with difficulty from plant tissues even after vigorous shaking or grinding. Some workers extract the material with boiling solvents direct, but the majority of them first digest with hot ethanolic KOH and then extract with petrol ether, ethanol, ether or mixtures of these. Such methods work well for grass and many other materials, but it is now clear that they fail for tissues containing considerable sugar, such as carrots. Apparently the sugars, under the influence of the alkali, polymerise round the carotene, rendering it inaccessible to petrol or ether. A few workers, fearing that some carotene may be destroyed by hot alkali or solvents, extract with cold acetone and subsequently with petrol and acetone, alternately or mixed. Apparently the acetone removes the water, after which the carotene becomes accessible to more acetone or other solvents. Yet dried, powdered vegetables and other materials are incompletely extracted unless first damped with water. For estimation the carotene is usually required in petrol ether. Acetone or alcohol can be washed out from petrol with water. Ether can be carefully evaporated under reduced pressure and the residue dissolved in petrol.

The xanthophylls are alcohols and frequently occur as esters of higher fatty acids. In analytical work the carotenoids are freed by hydrolysis through alkaline digestion of the plant material. In the "solvent extraction" methods the esters must be saponified and the chlorophylls removed, and both can be done by subsequently shaking the petrol solution with cold methanolic KOH, afterwards washing with water.

Removal of Xanthophylls

After the carotenoids have been brought into solution in a suitable solvent—usually one of the petrols—the xanthophylls must be removed. This is usually done either by partition between immiscible solvents or by differential adsorption. For the partition method the petrol solution is shaken two or three times with 90 per cent. methanol. Free xanthophylls, because they are alcohols, are hypophasic, that is, much more soluble in the alcohol or lower layer than in the petrol or upper layer, and are thereby removable from the petrol solu-

tion. Carotenes are epiphasic, that is, much more soluble in the petrol, in which they therefore remain. Xanthophyll *esters* are also epiphasic : hence the need for saponifying before separation. 85 per cent. ethanol is sometimes preferred to methanol, but aqueous diacetone alcohol is becoming increasingly popular. Removal of xanthophylls by adsorption on alumina, magnesium carbonate, calcium phosphate or other powder is more complete than phase separation, but there is danger of some loss of carotene. The separation is ingeniously done in a chromatograph, a vertical tube packed with the powder down which different pigments can be visibly washed at different rates by appropriate solvents. Any one of the carotenoids can be followed and isolated.

The last stage in the analysis is a measurement of the absorption of light. This is usually done in a colorimeter or photometer, but may be done with a spectrophotometer or photo-electric apparatus.

Utilisation of Carotene by Mammals

It may be asked, " If carotene is as good as vitamin A, can I not assure best night vision by taking a ' helping ' of carrots once a week?" Unfortunately the answer is " No ", for carotene in vegetables is not utilised so efficiently as preformed vitamin A. This is mostly through incomplete digestion—or more strictly absorption from the alimentary tract. After absorption into the blood, part of the provitamin (carotene) is stored in body fats, but most is converted to vitamin A (axerophthol) and stored in the liver until needed. Possibly this conversion is not complete, for even the carotene which is absorbed is less effective than preformed vitamin A, but little is as yet known about the mechanism of the transformation.

Alimentary Absorption of Carotene

The carotenes are hydrocarbons and are completely insoluble in water. Moreover, they occur as small particles enclosed in plant cells, where they are protected to a certain extent from digestive juices. Preformed vitamin A is also insoluble in water, but at least it has a hydroxyl group and is normally consumed in digestible fat or animal tissue : its chance of absorption is greater and it is in fact usually assumed to be completely absorbed. An ideal experimental procedure for estimating the percentage of carotene which is absorbed from food remains to be devised. The usual method is to estimate carotene in food and in fæces and to assume that the amount which has disappeared has been absorbed. This method is subject to several criticisms, some of which could be discounted by more careful technique. The principal shortcomings are as follows :

1. Workers estimating carotene by the alkaline digestion method would tend to under-estimate the carotene in the carrots consumed to a greater extent than in fæces, owing to the presence in the former of sugar which interferes with the analysis. The result would be a low calculated absorption.

2. Some of the carotene which " disappears " may have been destroyed in the alimentary tract and not absorbed at all.

3. There is always a yellow pigment in the fæces almost indistinguishable from carotene, even in animals kept on a carotene-free diet. This must be subtracted as a " blank " from the total fæcal recovery. The amount is variable, which makes the allowance uncertain.

There are also other difficulties making for unreliable results. Nevertheless, the following generalisations appear to be true.

1. The absorption of carotene from oily solution is about 50 to 80 per cent.

2. The absorption from vegetable foods varies up to about 50 per cent. Most of the factors involved are unknown, though probably mechanical protection of carotene by cell walls is the chief hindrance. The average is probably of the order of 20 to 40 per cent.

3. The percentage absorbed from very small doses is greater than from medium or large doses.

4. In general, man absorbs a lower percentage than the rat.

5. A normal secretion of bile appears to be necessary for absorption and dietary fat may play a part.

6. Medicinal paraffin and other indigestible oils reduce absorption considerably. If such a laxative must be taken, it should be taken late at night.

7. In disease the absorption is particularly low.

8. It might be supposed that cooking would soften the plant tissues and thereby make the carotene more accessible to digestive influence. In fact there is scanty proof of any considerable increase in absorption.

Other Techniques for Evaluating Absorption

Other methods for estimating the percentage absorption of carotene have been tried. They have the advantage of using a positive reaction instead of the gross alimentary disappearance. They do not evaluate the absolute absorption, but only compare one material with another. The principal methods are as follows :

1. Effect on vitamin A reserves. This is done by feeding test doses to a rat on a vitamin A-free diet and determining the vitamin A found in its liver.

2. Effect on the level of carotene in the blood.

3. Effect on dark adaptation. A subject is maintained on a diet containing no vitamin A. After some days or weeks his ability to adapt his eyes to seeing in dim light deteriorates. A comparison is then made of the doses of test materials required to bring his dark adaptation back to normal.

4. Effect on rat growth, as in the method of biological assay.

It will be seen that the experiments involve many difficulties and inaccuracies. But on the whole it seems reasonable to assume that carotene in oil (at the low dose levels used in biological testing) is worth about three or four times as much as carotene in vegetables (at levels corresponding to ordinary meals). In other words, the vitamin value of vegetables is only about $\frac{1}{4}$ or $\frac{1}{3}$ of that expected from their actual carotene content. In calculating the vitamin A value of diets one can bring in this factor *either* by dividing the carotene of vegetables by it *or* by scaling up the human requirement for vitamin A when carotene is its source. But one must be careful not to bring in the factor twice by doing both—as some authors appear to have done!

Biological Estimation

It is clear that even having perfected a method for determining the chemical carotene in a food we should still have to divide by an uncertain factor to find its vitamin A value. On first consideration it would

appear that the biological test overcomes the difficulties. Unfortunately that is not altogether true.

There are several ways of making a biological assay. The commonest is based on the growth rate of rats. A batch of young rats is put on a diet containing no vitamin A. When the rats have used up their vitamin A reserves they cease gaining weight. At this stage they are paired off, one receiving a dose of material to be tested, the other a dose of standard carotene in oil. The doses are given at two or more levels and several rats are used for each level. The gain in weight is determined over a standard period and dose-response curves are drawn, in which growth rate is plotted against daily dose. The level of unknown corresponding to the standard is found from this curve, and the vitamin value thereby determined.

Although biological tests are performed extensively they have serious disadvantages, the chief being as follows:

1. The method is laborious, slow and expensive, about 30 or 40 rats being required for each assay.
2. Rats vary in their response, so that the rats in one test must be as similar as possible.
3. A rat dosed too early may not be quite depleted; dosed a day late a rat may die.
4. The dose required is small. The percentage absorption of carotene when given in small amounts is higher than when given in amounts corresponding to ordinary meals. Hence a spuriously high vitamin content may be calculated.
5. Frequently an extract is first prepared and then dissolved in oil for dosing. It is the vitamin value of the extract which is thus determined and not that of the original plant.
6. The carotene concentration varies from one part of a plant to another (*e.g.*, the yellow core of a carrot may have only a few per cent of the carotene in the outer part). This makes accurate sampling of 50 or 100 mg. difficult. Moreover, cut plant fragments quickly lose water to the air, which makes accurate weighing impossible, and oxidation of carotene sometimes takes place in damaged plant tissues.
7. Man may not absorb and convert carotene with the same efficiency as the rat does.

In spite of these disadvantages, however, the biological test is a fundamental one, the result obtained being a true vitamin value. Chemical methods for provitamin A assay, though much more accurate, depend ultimately on absorption of light. Their reliability is now considerable, but a certain amount of scepticism may be justified where an entirely new material is concerned; the final appeal must be biological. Although carrots contain more carotene than spinach the vitamin activity of spinach is sometimes found to be higher than that of carrots. Several explanations are possible, one being that spinach may contain vitamin-active xanthophylls not estimated as carotene.

Attempts have been made to use other criteria for vitamin assay, such as the effect on teeth, eyes or vaginal cells, but none of them has been used at all extensively.

Sources of Carotene

Where preformed vitamin A is found in animal tissues and products carotene is often found too. The pigment in serum, butter, bone marrow and human fat is mostly carotene, and in egg yolk includes carotene. Carotene is found in carrots, grass, green leafy vegetables and in certain fruits, notably apricots. The richest source is probably red palm oil in which most of the pigment is α-carotene which has half the vitamin activity of β-carotene. An interesting discovery is that certain deep sea muds off the coast of California have considerable quantities of carotene and other pigments: their origin is unknown but undoubtedly ancient, and their stability presumably due to anaerobic conditions. Peas and beans contain small amounts of carotene. The "flower" of cauliflower, onions, potatoes, parsnips, beet, radishes and other roots usually have little or none. Nuts contain practically none. Apricots, mangoes, peaches and a few other fruits have moderate amounts, but fruits are generally poorer than vegetables. Raspberries, strawberries, pineapple, grapefruit, apples, plantains, bananas, and many others have less than 100 μg. per 100 g.

Carotene Concentration in Common Foods

The table shows the usual range of carotene concentration in the edible portion of common foods. Some values are critically selected from published tables, but most have been determined in this laboratory by the acetone extraction method. A single value means that not enough specimens have been analysed to define the range. Carrots and the spinach group (including nettles) are richest, and of these carrots are the cheapest home-grown source of the vitamin. Salad vegetables, cabbage, etc., are comparatively low in carotene, but are valuable sources of other vitamins and mineral elements. In using such a table to compare vitamin values of diets one should bear in mind that at a normal meal a greater weight of, *e.g.*, tomato or carrot is consumed than of, *e.g.*, parsley or cress; thus a "helping" of carrots contains 12,000 μg. and half a "bunch" of watercress contains 1,200 μg.

CAROTENE CONTENT OF SOME FOODS DETERMINED BY CHEMICAL METHODS

	μg. *per* 100 g. *Fresh Weight.*
Carrot	7,000-21,000
Carrot tops	9,600
Spinach	6,000-12,000
Clover	10,000-20,000
Grass	3,000-15,000
Beet spinach	2,400-6,000
Perpetual spinach	6,000
Common nettle	9,000-14,000
Broccoli	1,800-4,800
Calabrese	4,000
Parsley	3,000-9,000
Watercress	1,800-3,000
Cress	900-1,800
Lettuce	1,200-4,000
Tomato	1,800-3,000
Garden pea	250-300
Runner bean	60-500
Cabbage	150-1,200
Mango	600-3,000
Apricot	1,800-2,400
Plum	100-400
Blackberry	100-250
Gooseberry	100-200
Cherry	100-200
Cocoa and chocolate	25-40

So far as is known the " range " covers the normal variation. Values outside these ranges are occasionally encountered, *e.g.*, a very pale carrot may have but a 1,000 μg. per 100 g., and fodder carrots have less still, while individuals of common varieties occasionally reach 24,000. There is considerable individual variation influenced by age and development, season, strain, type of soil and other factors. Summer carrots are usually not above 9,000, but if left to mature until autumn most varieties average 12,000. A few varieties of deep red carrots have much higher values, ranging up to 70,000.

Carotene almost invariably accompanies chlorophyll, the green pigment found in plants, and, broadly speaking, the deeper the green the higher the carotene content. For instance, pale forced cabbage lettuce has only a quarter of the carotene in deep green cos lettuce. The etiolated heart of a cabbage has but a hundred to two μg. per 100 g., while the outer leaves may have as many thousand—one more reason for eating the outer leaves. Carotene concentration often runs parallel with ripeness but not necessarily so. For instance the ripe side of a plum had two and a half times the carotene found on the opposite side, but peas and gooseberries showed a decrease with ripeness.

High and Low Values in the Literature

Carotene values are sometimes found in the literature well outside the ranges in the table, and some explanation seems called for.

High values can be accounted for in various ways. Total carotenoids may have been measured and all assumed to be carotene. For instance, wheat contains xanthophylls but only a small proportion of carotene, yet the value for total carotenoids frequently appears in tables of carotene values. The high value of 60,000 for tomatoes sometimes seen in tables includes lycopene, a pigment with similar colour and solubility to carotene but having no vitamin activity. Xanthophylls are usually separated from carotenes by partition between immiscible solvents. The xanthophylls may be present in the plant in the form of esters, which, if not saponified, have a similar solubility to carotene and may therefore be estimated with it. Sometimes values for carotene are calculated on a dry weight basis, and a value ten times too high is carelessly copied into tables on a fresh weight basis. No doubt this happened with parsley.

Low values are usually due to incomplete extraction of carotene or to loss during manipulations. Carotene is not highly stable, and its oxidation is hastened by light, high temperature and complete evaporation of solvent. Although stable for several days in petrol, carotene in acetone slowly fades under some conditions. Hence methods involving lengthy extraction, evaporation, heating, etc., may give low results. The commonest cause, however, seems to be incomplete extraction, and this has often been serious in the case of carrots, values below 6,000 μg. per 100 g. occurring frequently in older literature. Early and immature specimens with low values have sometimes been analysed under the erroneous impression that full size implies full development. Values obtained on fresh vegetables by the biological method are nearly always lower than those obtained chemically, for reasons already explained, and the two should not therefore be classed together uncritically.

Quantitative Comparison of Vitamin with Provitamin

Before discussing daily requirements some details about the relationship between vitamin A and carotene should be recapitulated.

1. The International Unit (I.U.) is *defined* as 0·6 μg. β-carotene. The activity of *all* forms of the vitamin is measured by comparison with the activity of β-carotene under standard conditions.

2. Preformed vitamin A given in small doses to rats is about twice as active as β-carotene, weight for weight and both dissolved in digestible oil; hence one I.U. is approximately 0·3 μg.

3. Other carotenoids have half or less the activity of β-carotene. Most of them are quite inactive.

4. β-carotene is the commonest of the provitamins A.

5. In performing biological tests for vitamin A the rats are " calibrated ", as it were, with a standard solution of β-carotene in oil. Thus each 0·6 μg. of β-carotene from a test material, dissolved in similar oil and given to rats, should register one I.U.

6. Carotene in vegetables is less effective than the same carotene in oil, some 2 μg. being required to produce an activity of one I.U. at low and moderate feeding levels, even more being required at high levels.

7. At low dose levels the difference between the activities of β-carotene and preformed vitamin A is thought to be mainly one of conversion in the body.

8. The difference between the activities of β-carotene in oil and in vegetables at all feeding levels is known to be one of absorption into the body from the alimentary canal.

Human Requirement

Controversy rages over the daily amount of vitamin A needed by man. Much of the trouble is caused by the asymptotic nature of the dose-response curve and by difficulty in deciding on satisfactory nutritional criteria. Some would put it at a value above which no definite deficiency symptoms are seen—a desirable condition but a vague measure. Others prefer to take an optimal value above which no improvement is detectable by any means whatever.

When a man's diet is low in vitamin A but adequate in other respects various symptoms slowly appear. Among the first is a decreased ability to adapt his eyes to seeing in a dim light. Apparatus is available capable of measuring dark adaptation with considerable accuracy and minute changes can be recorded. By the application of much patience and by the subject living on a strictly controlled and monotonous diet it is possible to ascertain the daily intake of vitamin A which just maintains maximum dark adaptation. An idea of the magnitude of the undertaking can be gathered from the fact that the experiment has to be conducted for some months and several human subjects are needed. Other less tedious methods have been tried, but the results are conflicting.

In 1937 a committee of the League of Nations recommended 3,000 I.U. per man per day, but did not specify whether this included carotene. While many people would put it lower, some place it higher. For the sake of argument let it be taken at 3,000 I.U. of preformed vitamin A. Now, when carotene in vegetables is the source of the vitamin three or four times as much is needed, say, $3{,}000 \times 3\frac{1}{2} \times 0{\cdot}6$ or about 6,000 μg. determined chemically. (Of course, if biologically deter-

mined values are used for vegetables these would be in International Units, and the daily requirement would then be taken at a correspondingly lower figure.) The butter, margarine, milk and other rationed foods, at the time of writing, provide about ¼ to ½ the daily requirement, leaving 2,000 I.U. to be obtained from other sources. This can be had in various ways, but most satisfactorily from a mixed diet, which includes plenty of vegetables. In that case about 4,000 μg. carotene would be needed. Britain's carrot crop alone—if shared equally—would just cover this. The green vegetable crops together, though not contributing so much carotene as the carrots, would supply a satisfactory margin of safety. The great problem, however, is to ensure even distribution throughout the population.

Cooking and Processing

Vitamin A and carotene, unlike water-soluble vitamins, are relatively stable to cooking. Being insoluble in water and practically indiffusible none is lost in the water used for cooking vegetables.

The carotene in vegetables is not destroyed by such processing as scalding and canning. The carotene content of canned tomatoes, runner beans and carrots was still high after 4 years' storage, including 18 months at an unusually high temperature.

Certain vegetables, notably the soya bean, contain an enzyme system under whose influence carotene is oxidised. When the plant cells are damaged and disorganised, as by mashing or chopping, carotene is destroyed by this system. The enzyme component of the system is heat labile, and can be inactivated by scalding —holding in boiling water for 2 minutes.

The Drying of Vegetables

Provided suitable precautions are taken, vegetables can be dried with little or no loss of carotene. When stored in air, however, the carotene is slowly oxidised. This process, it is claimed, can be retarded by " blanching " the fresh vegetables just before drying and by storing under suitably controlled conditions. The vegetables can be reconstituted by soaking in water, and are then indistinguishable from fresh. An interesting product is carrot flour, which can be prepared by dehydrating carrots in various ways. The red powder contains about 50 per cent. sugar and much carotene. It can be used in confectionery and numerous other products both as sweetening and a nutritional agent. On the basis of the carotene content of fresh autumn carrots a good quality powder should have up to 150,000 μg. per 100 g., when as little as 5 g. will supply a man's requirement for one day.

An extraordinary product is the preserved carrot manufactured by certain firms. Carrots are washed and cooked until soft. They are then held in hot syrup until most of the water is replaced by syrup. The product, which can be cut like a firm jelly, is scarcely recognisable and tastes something like " crystallised " pear. It can be disguised as fruits or ginger, and can be used in numerous kinds of confectionery, cakes, puddings and lunch bars. The carotene suffers little loss in the process.

The amount of carotene in hay is small, but methods have been worked out for drying grass with retention of carotene. Dehydration is also said to be preferable to sun-drying for preservation of the carotene in fruits. Carotene is evidently reasonably stable in dried fruits, for dried apricots, peaches and prunes contain fair amounts. Raisins and sultanas contain only negligible quantities, but this is probably also true of the fresh fruits. Destruction of carotene in stored fruit can be retarded by SO_2.

Margarine is still coloured with an artificial dye. As the natural pigment in butter is mostly carotene, would it not be more appropriate to use carotene in margarine? This would use up a by-product, save making a synthetic product having no food value, and improve the margarine nutritionally. More might be incorporated in late winter when the national intake of vitamin A is at its lowest.

Storage

Although carrots are at their best in summer and autumn, they may be left in the ground through the winter. Losses occur through frost or parasites, but the carotene in those that survive appears to be maintained. Carrots may be clamped, and the carotene then only falls off to a small extent. Watercress, cabbage and a few other green vegetables are obtainable through the winter. Hence the vitamin is available all the year round, although it is scarcer in late winter and early spring. These are the times when preserved vegetables containing carotene are most valuable.

Conclusions

Carotene—or provitamin A—is converted into vitamin A in the animal body. But, because digestion and conversion are incomplete, the provitamin has to be eaten in larger amounts than the preformed vitamin. However, it occurs fairly abundantly in most green vegetables, carrots and some fruits, so that a good mixed diet containing plenty of vegetables supplies the daily requirement. Carotene has a high stability in carefully processed foods stored anaerobically and is neither destroyed nor washed out by ordinary cooking.

Ministry of Food

Use of Soya Flour

A GENERAL Licence has been issued under the Soya Flour (Control and Maximum Prices) Order, 1941, authorising the use of soya flour in the manufacture for sale of the following products :

1. Sausages, sausage meat, slicing sausage, haggis, black puddings, white puddings ;
2. Sugar confectionery as defined in the Cocoa, Chocolate and Sugar Confectionery (Licensing and Control) Order, 1941, chocolate and chocolate confectionery, marzipan ;
3. Any soya flour mixture which a person is authorised to manufacture or prepare for sale for use as human food under the terms of a licence (except a General Licence) granted by the Minister of Food under any Order other than the Soya Flour (Control and Maximum Prices)Order, 1941, provided that a fixed or maximum price is prescribed for that mixture by the Minister of Food.

Any person using soya flour in the preparation for sale of a mixture that is not a cooked article ready for human consumption, or that is not included in the above list, should apply for a licence under the Soya Flour (Control and Maximum Prices) Order, 1941. Applications should be sent to the Cereal Products Division, Mount Stewart Hotel, Colwyn Bay.

Bacteriology and Food Preserving

Bacteriology is a very specialised subject, but in one of the largest canning and preserving concerns in this country it was considered that, apart from the laboratory workers, the staff in general should know something about it. This article was written by the firm's bacteriologist for the express purpose of presenting the subject, as it affects preserving, to the layman in the industry.

J. G. BAUMGARTNER.

BACTERIOLOGY is one of the foundations of food canning. The freshness or quality of the food before it is canned, and its keeping properties after canning, depend upon the control or elimination of bacteria. In order to understand the principles of canning, and, indeed, all food preserving, it is necessary, therefore, to have some knowledge of bacteria and their characteristics.

All living things can be separated into two great classes—animal or plant. In some cases characteristics are merged and classification is difficult, but in general it can be said that animals ingest solid food into a gut, whilst plants absorb their food in solution through their cell walls.

The plant class includes types other than the ordinary plants with leaves, stems and roots; the tiny green threads called algæ, which grow in ponds, are simple plants without leaves or roots. The simplest forms of life are the bacteria, and, although exhibiting some characteristics of the animal class, they are usually classified as plants. Each bacterium consists of a single cell, which is usually between one five-thousandth and one twenty-thousandth of an inch in length. The cell is composed of protoplasm—a watery protein material resembling white of egg, enclosed in a permeable envelope or membrane. Proteins are complex nitrogen compounds present in all animal and plant tissue. In liquids many bacteria are capable of swimming movement by means of fine threads, called flagella, which appear to be outgrowths of the cell membrane. Most of the bacteria are rod-shaped, and they derive their name from the Greek word "bakteria," meaning "rod". There are, however, other types, some being globular, and others curved or spiral-shaped. Bacteria can be put into one of these three main groups, based on shape, as follows:

(1) *Bacilli*—Rod-shaped. (Singular—*Bacillus.*)

(2) *Cocci* (pronounced "cockeye")—Globular. (Singular—*Coccus.*)

(3) *Spirilla*—Spiral-shaped. (Singular—*Spirillum.*)

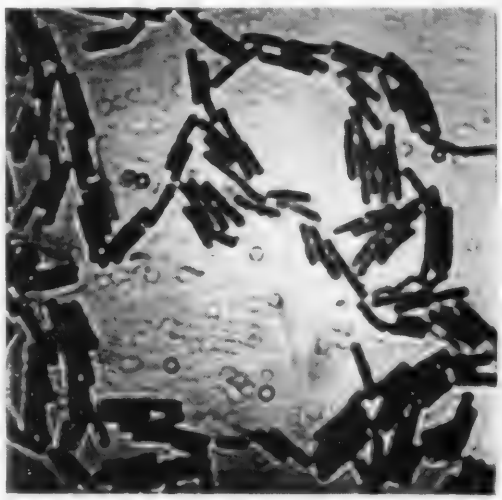
Only the bacilli and the cocci are important in food bacteriology, the significance of the spirilla being chiefly medical.

Each of the bacilli and cocci groups is made up of hundreds of types or species. The characteristics of the species in a group are closely related, and often distinction between them has to be made on the basis of the chemical changes they produce in various materials.

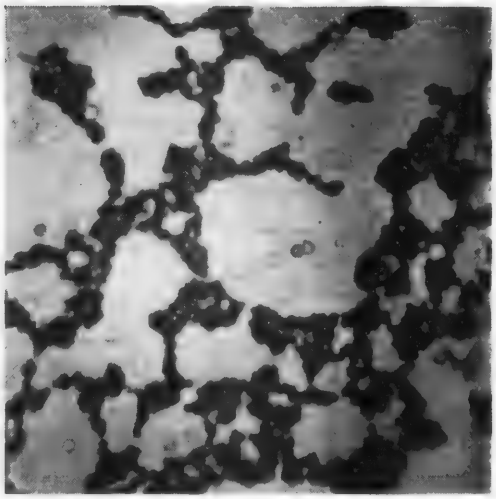
Because of their association with disease and spoilage of food, bacteria have gained a bad reputation, and it is not always appreciated that many of their activities are beneficial. For example, bacteria are responsible for manuring the soil by decomposing dead plants into simple chemicals which can be reabsorbed as food by other plants. Without this process the soil would rapidly become exhausted. Bacteria are also used in the treatment of sewage, where they convert the foul-smelling solid material into odourless substances capable of being disposed of as fertilisers. Other examples of usefulness are the manufacture of vinegar, in which bacteria assist in converting the starch of grain into acetic acid, and the fermentation of brined vegetables by bacteria for pickle manufacture. In this process the bacteria, in addition to producing flavouring substances, convert the sugar in the vegetables to lactic acid, which, with the brine, acts as a preservative.

The Growth of Bacteria

Bacteria multiply, not by developing seeds which in turn become plants, but by simple division. A constriction appears in the middle of an individual and it breaks into two. Each of these repeat the process and give rise to four progeny; the four become eight, and so on. This process is known as "fission", and may occur in each bacterium about every 20 minutes under favourable conditions. This rate of development means that a single bacterium will give rise to one thousand million in ten hours. Due to exhaustion of food and the poisoning effect of the chemicals they produce, the growth-rate is slowed down after some hours, and eventually ceases. The rapidity with which bacteria can develop should be thoroughly appreciated, since it accounts for the rapid spoiling of food in warm



Bacilli (×1000).



Cocci (× 1000).

weather. The result of the activity of a few bacteria is negligible, but if growth is allowed to occur for a few hours the results will be increased a millionfold and will be very apparent.

Bacteria are extremely widespread in nature, and are found in soil, water, decaying refuse and the intestines of man and animals. Because of their small size, the bacteria are readily spread by air currents. Unless special precautions are taken, therefore, bacteria are always present in the air and on the surface of any exposed object, but until food and moisture are available they are unable to grow and are harmless.

The need for food and water is fundamental in all forms of life. Bacteria are no exception. In many ways they are comparable with ordinary plants. Just as garden plants need soil for growth, so bacteria require some form of soil. Most moist foods, particularly those containing sugar or meat, form an excellent soil for bacteria, but must first be made digestible in order that they may be absorbed as food. To effect this, bacteria manufacture substances called enzymes, which act on material such as sugar and meat, and change them into simple chemicals which suit their food requirements. As a result of this enzymic action, sugar may be changed into acids, sometimes with the production also of gases such as carbon dioxide and hydrogen, and meat ultimately changed into various substances, including ammonia, carbon dioxide and the foul-smelling compounds which are characteristic of putrid meat. The decomposition of sugar by bacteria is usually referred to as *fermentation*. *Putrefaction* refers to the action of bacteria on meat or other protein substances.

In addition to causing these chemical changes, some types of bacteria produce poisonous substances called toxins; these bacteria are the *pathogens*, or disease producers. When pathogenic bacteria enter a flesh wound, it is the toxin they produce which poisons the surrounding flesh and causes it to become " septic ".

Certain types of bacteria produce toxin during their growth in food. Such food causes food poisoning when consumed. One toxin produced in this way causes the illness known as botulism, and is so deadly that a minute amount is often fatal. This toxin is, fortunately, readily inactivated by boiling. Food poisoning is also caused through consumption of food containing certain types of living bacteria. These multiply and liberate toxin in the intestinal tract.

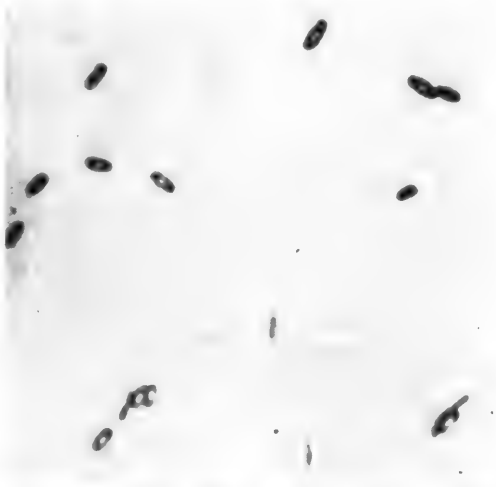
Apart from chemical changes which affect palatability, then, food in which bacteria have developed may constitute a serious menace to health.

The Effect of Temperature on Bacteria

Bacteria are very susceptible to the effects of temperature. By freezing, their activities can be stopped, just as the growth of plants is prevented by frost. The freezing of the water of which they are largely composed interferes with their normal life processes. It is this fact upon which the practice of refrigeration is based. Moderate heat, such as normal body temperature, stimulates their growth. One particular group requires a higher temperature than any other group for growth, and, in fact, grows best at temperatures which destroy many other types. These are known as *thermophiles* (which means " heat-lovers "), and they are extremely difficult to kill by heat. They cause considerable trouble in canned food exported to tropical countries, where the temperature is suitable for their growth.

High temperature, such as that of boiling water or steam, kills growing bacteria instantly. The action of heat is thought to coagulate, or " set ", the protoplasm of the bacteria, just as an egg is " set " by boiling in water. Some types of bacteria, however, are able to cease growing and enter a state of rest by concentrating their existence in a small part of the cell and forming a tough membrane round this portion. Each bacterium forms its own membrane, and when in this condition they are called *spores*, and are much more resistant to heat and other adverse influences than when actively growing.

As a rule, spores are only formed by the rod-shaped bacteria. The position and shape of the spore is characteristic for a given species of rod; it may be



Bacilli in Spore Stage. Spores show as clear oval portions of rods. (× 1000.)

situated in the centre, near the end, or at the end of the rod, and may be round or oval in shape. As the spore matures, the remainder of the cell may disappear, until finally only the spore is left. The spore stage is only temporary, and under favourable conditions the spore germinates like a seed, and growth recommences. The formation of a spore is a gradual process, and actively growing bacteria do not instantly form spores when exposed to heat.

The following table gives a rough classification of the effects of temperature :

THE EFFECT OF TEMPERATURE ON BACTERIA.

Temperature.	*Effect.*
5° C. and below.	Growth prevented or very slow.
5° C. to 10° C.	Lower limit of growth for most types.
20° C. to 40° C.	Maximum growth for most types except thermophiles.
45° C.	Upper limit of growth for most types.
55° C. to 65° C.	Maximum growth for thermophiles.
100° C.	All actively growing bacteria killed instantly.
Above 100° C.	Spores killed (depending on time heat is applied and other factors).

By *sterilisation* is implied the total destruction of all bacteria and their spores. This is the basic principle of canning, and much work has been carried out on the subject. As a result it has been discovered that the resistance to heat of bacteria or their spores is greatly influenced by many factors. Moist heat is more efficient than dry heat. Thus steam at 100° C. is better than dry air at 100° C. The character of the material in which the bacteria are heated is very important. Acids are distinctly unfavourable to most bacteria, even under normal temperature conditions, and when food containing acid is heated the degree of heat necessary to kill the bacteria in it is less than that required to kill them in food containing no acid. In short, the harmful effect of the acid and the heat are additive. As an example, in canned fruit, bacteria or spores are more easily killed by heat than in soups containing no acid.

Another important factor concerns the number of bacteria or spores present in the food to be heated. At any temperature, the greater the number of bacteria or spores, the longer is the time required to kill them all. When heat is applied, the spores do not all die off at the same time. First the weak spores die, next the moderately resistant, and finally the very resistant, which are difficult to kill without continued application of heat. With a large collection of spores the number of very resistant types will be higher than that in a small collection, and therefore longer heating or higher temperature will be necessary to kill them all. This shows the importance of using only fresh material for canning, for, if it is stale and contains large numbers of spores, sterilisation is made more difficult.

Pasteurisation

In certain cases the high temperature called for by sterilisation may have a deleterious effect on the product being heated, and a method of processing known as *pasteurisation* is resorted to. In this treatment the lower temperature employed, usually 60° to 80° C., is intended to destroy only actively growing bacteria, leaving spores unharmed. Since the disease-producing bacteria likely to be present are all destroyed by pasteurisation temperature, and higher temperatures seriously affect flavour, this method has been universally adopted for the treatment of milk. In canning, the pasteurisation method is chiefly used for very acid products, in which the spore-forming bacteria are usually unable to develop; in such cases any spores which survive the treatment can be ignored. Other products so treated may include sauces and ketchups.

The Action of Disinfectants

In addition to heat, which is the most efficient method of killing bacteria, many chemical substances have a destructive or poisonous effect. These are commonly known as disinfectants. They usually act by combining chemically with the protoplasm of the bacteria, producing changes which kill them or prevent their growth. Since bacterial protoplasm closely resembles the protoplasm of the human body, most of the substances which are poisonous to bacteria are also poisonous to man. This severely limits their application and accounts for the use of many chemicals as food preservatives being forbidden by law.

In disinfection by chemicals there are several factors to be considered. For any disinfectant there is a concentration below which it ceases to act fatally on the bacteria, and may merely prevent their growth. In this case the bacteria may recommence growth should the disinfectant be further diluted or removed. This point is very important when a disinfectant is greatly diluted by the material being disinfected.

Sufficient time must be allowed for the disinfectant to act. The time required will depend on the concentration of disinfectant and the character of the substance being disinfected. As with heat, spores are more resistant to disinfectant than actively growing bacteria, and therefore require longer exposure or higher concentrations. It is essential that the disinfectant and the bacteria or spores come into intimate contact for any action to take place. For this reason materials such as solid refuse should not be disinfected by chemicals, and semi-solids or liquids must be thoroughly mixed with the disinfectant.

The presence of protein materials, such as meat or blood, decreases the effect of most disinfectants, because they combine with the protein, leaving less to react with any bacteria present.

Ideally, the only disinfectant necessary in a food factory should be soap and hot water. If this is applied efficiently and frequently, there should be no opportunity for the accumulation of decaying refuse or dirty plant needing disinfection. Thorough scrubbing with hot soapy water will markedly reduce the number of bacteria on a smooth surface by removing small particles of dirt, grease, etc., which may harbour them. Wooden surfaces which are pitted and grooved are extremely difficult to disinfect, since bacteria-laden material accumulates in the crevices and cannot be reached.

If drastic measures are necessary, the best disinfectant for factory use is sodium hypochlorite. This solution readily liberates chlorine, to which bacteria are extremely susceptible; it can be used for disinfecting tables, floors, drains, etc.

(*To be continued*)

Gas Production in a Fermenting Dough

Its Automatic Measurement

J. R. SEVILLE (*Director, R. B. Seville, Ltd.*)

THE first aim of the scientist, in whatever field he is engaged, is to provide ways and means to separate and measure the various influences and factors at work in the processes which he is studying. Lord Kelvin said: "If you can measure that of which you speak, and can express it by a number, you know something of your subject; but if you cannot measure it, your knowledge is meagre and unsatisfactory".

Early Types of Apparatus

One of the most important factors in bread-making is gas production. It was also one of the first to be scientifically measured. In 1882 Hayduck[1] described a simple apparatus in which the carbon dioxide produced by alcoholic fermentation was measured by the displacement of water from a burette inverted over a water-trough.

Fifteen years later Kusserow[2] described an alternative apparatus which was the forerunner of the displacement bottle method with which all laboratory workers are familiar. Both of these methods are described by Jago,[3] and both are still used extensively for the measurement of gas production.

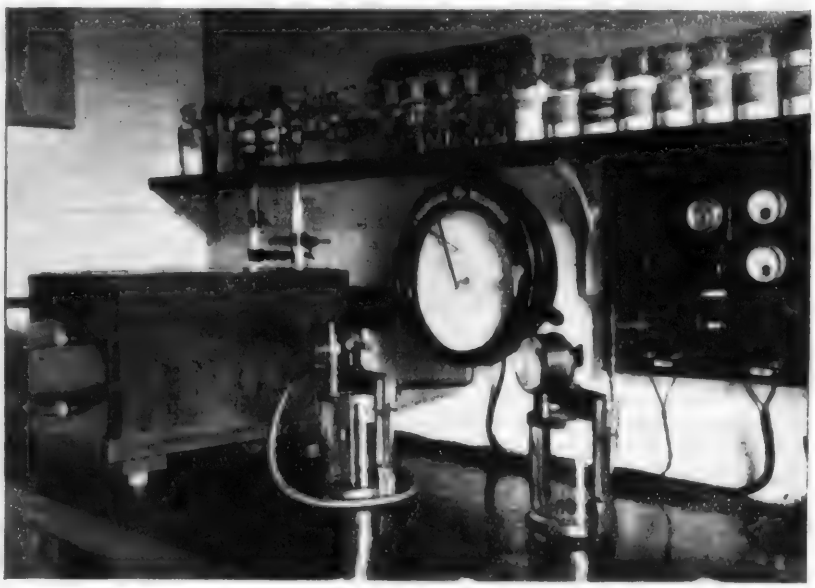
As the years went by the need for a recording gasometer became increasingly felt. During the last two decades several ingenious and more or less elaborate appliances have made their appearance. Most of these consist essentially of a bell buoy inside which the gas is collected over water or other liquid, and a clock-driven chart on which the rising of the buoy is recorded by a pen.

In one instrument, the fermentograph, the dough is confined in a rubber bag which is submerged in a water bath. As the carbon dioxide is generated in the dough, the bag expands and displaces an equal amount of water. The consequent loss of weight is transferred by the suspension to a scale head, and is recorded on a chart.

It will be observed that in all of the foregoing methods the gas is measured by liquid displacement, and in all save the last mentioned the gas and the liquid are in contact with each other. As is commonly known, carbon dioxide is soluble in water. This fact makes necessary the use of some liquid in which the gas does not dissolve, or, alternatively, a partition of oil on the surface of the water, so that the carbon dioxide does not come into contact with it. Schmalz and Sullivan[4] have shown that even in the case of the fermentograph there is a loss of gas by diffusion through the walls of the rubber bag, which may amount to as much as 5 per cent.

In 1932 three American cereal chemists[5] suggested that, instead of measuring the volume increase of the gas at more or less constant pressure, it might be equally satisfactory to measure the pressure increase at constant volume, or, in other words, when the gas is confined in the fermenting vessel.

The advantages possessed by such a method will be at once apparent. The apparatus consists simply of a suitable fermentation vessel (immersed, of course, in a thermostatically controlled water bath) and a pressure gauge. There is no second vessel, consequently a smaller water bath will serve for a given number of units. There is no displacement liquid to be manipulated, hence the time taken to operate and maintain the unit is considerably reduced.



A B C E

A—Thermostatically controlled water bath.

B—Pressure vessel connected to C.

C—Cambridge recording pressure gauge.

D—Pressure vessel fitted with dial gauge.

E—Control panel.

The apparatus as modified by the original workers[6] was equipped with a mercury U-tube gauge, and pressures up to 700 or 800 mms. of mercury (approximately 15 lbs. per square inch) were commonly attained. Subsequently another worker, Landis,[7] suggested the use of a bourdon-tube dial gauge in place of the mercury manometer. This proved to be equally satisfactory, and made for a more robust and compact appliance. The gauge was mounted on the lid of the pressure vessel in the manner shown at *D* in the illustration.

It was recently decided to adopt the pressure method of measuring gas production in the author's laboratory. In order to make the test as automatic as possible, a Cambridge recording pressure gauge was installed, and connected by pressure tubing to one of the fermentation vessels. This instrument is quite sensitive and accurate throughout the scale range, and, as will be seen later, it yields results which check very closely with those obtained by the older method.

Details of the Present Method

The pressure range decided upon was 0 to 5 lbs. per square inch. Higher pressures than this are unnecessary and tend to the development of leaks in the system. On the other hand, extremely low pressures (say, 0 to 5 inches w.g.) give readings which are unduly affected by slight temperature variations in the water bath. A variation of 0·2° C. would, at these low pressures, affect the result by more than 5 per cent.

When first considering this method of measuring gas production, one immediately questions the effect of the increasing pressure on the fermenting dough. It has been shown by Sandstedt and Blish,[8] and subsequently by other workers, that gas production is not appreciably affected by the increasing pressure, at any rate up to approximately 20 lbs. per square inch. This is confirmed by the results given below.

In arriving at these results, two equal portions were weighed off from each test dough. One of these was placed in the pressure vessel connected to the recorder, and the other in a standard displacement apparatus. If gas production is unaffected by the pressure developed in the pressure vessel, there should exist a simple relationship between the two sets of readings. That this is, in fact, the case is shown by a comparison of columns 2 and 3 in the table.

In this table are given three sets of results. In each set column 1 is the pressure reading obtained on the recorder. Column 2 is the number of c.cs. of liquid displaced in the standard apparatus. Column 3 is the result of multiplying column 1 by a constant—in this case 78. The agreement between the last two columns is as close as one could expect to obtain even when using two identical displacement units.

Measuring Gas Retention

One criticism of the pressure method is that it does not permit the separate measurement of the gas-retaining capacity of the dough. Work done in the author's laboratory, however, has led him to the conclusion that gas retention, as commonly measured, is difficult to correlate with baking quality. Certain inferences may, of course, be drawn, but it would appear that, unless gas retention is measured under actual bakery conditions, no great reliance can be placed upon the results.

There is being developed in this laboratory a method in which the dough under test is mixed, fermented, handed up and moulded under controlled bakery conditions. At this point two standard baking pans containing the dough ready for proofing are taken and proofed to a predetermined height in a thermostatically controlled laboratory proofing cabinet. The time taken in proof is automatically recorded. At the same time, from the dough in a third pan is weighed the necessary amount for the gas-production apparatus.

It is evident that we have here a method of comparing the total gas production of the dough with its gas-retaining power *under actual working conditions*. It is, of course, an advantage to carry the proof considerably beyond the usual point, so that any weakness at the oven stage may become apparent.

Interesting results have already been obtained by this method, and it is reasonable to believe that it holds considerable promise as a reliable and informative routine test.

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TABLE SHOWING THE AGREEMENT BETWEEN THE DISPLACEMENT AND PRESSURE METHODS OF MEASURING GAS PRODUCTION.

Time.	*Batch No. 1.*			*Batch No. 2.*			*Batch No. 3.*		
	Col. 1. lbs. sq. in.	*Col. 2. c.c.*	*Col. 3. 1 × 78.*	*Col. 1. lbs. sq. in.*	*Col. 2. c.c.*	*Col. 3. 1 × 78.*	*Col. 1. lbs. sq. in.*	*Col. 2. c.c.*	*Col. 3. 1 × 78.*
2 hours	0.36	29	28	0.45	36	35	—	—	—
3 hours	1.00	78	78	1.10	86	86	1.17	92	91
4 hours	1.78	139	139	2.05	160	160	2.20	171	172
5 hours	2·80	218	219	3.20	250	250	3.27	255	255
6 hours	4.00	311	312	4.50	352	351	4.55	356	355

Correspondence

The Saccharin (Control and Prices) Order

DEAR SIR,—The Saccharin (Control and Maximum Prices) Order, 1941 (No. 2129), dated December 30, 1941, is one of the Emergency Orders in the range of the Food Substitutes Regulations; according to it blancmange powder, cornflour or custard powder must not be mixed with saccharin, thus cancelling a number of licences previously granted to manufacturers of sweetened custard and blancmange powders.

The manufacture of so-called "sweetening solutions", except for pharmaceutical purposes, is forbidden. This makes the case of Elixir of Saccharin B.P.C. a curious one. To the best of my knowledge the sale of this preparation over the counter as packed goods in 1-oz. or 2-oz. bottles is not allowed, but its sale in large quantities is naturally not restricted. The retail chemist is thereby placed in an awkward position. A customer may demand 1 oz. of Elixir of Saccharin B.P.C., and the chemist has to give it to him with his blessing—"for pharmaceutical purposes only".

The instructions embodied in the Order are not complete, as, for instance, the sale of saccharin tablets in packets is suggested; and the sale of saccharin tablets in bulk is not forbidden.

Saccharin solution, in my opinion, is not always a substitute for sugar. The sweetening effect is given by saccharin powder, but this has no nutritious property. The chemical definition of saccharin is given in the Order, but there is no definition of sugar, by which one presumes sucrose is intended.

Many food preparations are sweetened with saccharin, such as cordials, for example, and in my opinion there is no objection to using saccharin as a sweetening agent in any such preparations, with the exception of those expressly mentioned in the Saccharin Order.

A definite ruling in this matter would certainly clear the air.

Yours faithfully,
CARL SCHMEIDLER,
Managing Director.
C. R. Harker, Stagg and Morgan Limited.

More about Saccharin

DEAR SIR,—In the *Pharmaceutical Journal* edition of January 3, on page 2, will be found some details of the new Order made by the Minister of Food with regard to maximum prices for saccharin. It states that "the Order also prohibits the manufacture of saccharin and dulcin solutions except for pharmaceutical uses, and the sale of sweetening powders capable of being used as a substitute for sugar". . . . "These provisions come into force on February 1, 1942."

We, along with many other essence manufacturers, have been supplying saccharin solutions for many years to all classes of food-stuff manufacturers—*e.g.*, mineral water manufacturers, bakers and confectioners, ice-cream manufacturers, lemon curd manufacturers, etc.

The writer is of the opinion that the Minister of Food, in bringing into being such an Order, has not been fully conversant with the use of sweeteners, which are so vital and important in maintaining production of essential food-stuffs, especially so in these days.

We are in full agreement that maximum prices for saccharin tablets, saccharin solutions, etc., should be enforced for a definite standard of quality, whether sales are made direct to the retail trade for re-sale to the public, or whether the sweetener is for sale to food manufacturers for use in their products.

We have been careful not to supply any firm or person who would not guarantee that the sweetener which they purchased from us was to be used solely in the manufacture of essential food-stuffs.

The mineral water trades are to a great extent dependent upon saccharin and saccharin solutions to maintain their output, and liquid sweeteners have also been used extensively in the manufacture of ice-cream.

We may mention that we are supplying sweetener to a large number of important firms who hold War Office contracts for the supply of food-stuffs to H.M. forces, canteens, etc.

In the circumstances we consider that a strong complaint should be made to the Minister of Food with regard to this Order, and that all possible should be done to persuade various Associations of food-stuff manufacturers, and their members, to make similar representations.

In particular, the bakery trade will be faced with very much greater difficulty in fulfilling the demand for their products, if compounded sweeteners are not available.

Some other points which might be brought before the notice of the Minister of Food are:

(1) The loss in revenue to the Exchequer due to the restricted sales of saccharin.

(2) Such an Order gives a monopoly to the actual manufacturers of saccharin, dulcin, thus cutting out the present distributors who can supply sweeteners along with their other products.

(3) Psychological effect on the public if they are unable to purchase sweetened confectionery, mineral waters, etc. The duty of all food manufacturers is to maintain in the public that feeling of confidence and well being which emanates from being able to purchase their requirements of the necessary foods.

(4) Members of the public and of the various food manufacturers Associations should write to their local Member of Parliament about the matter.

(5) The Ministry of Food, Sugar Section, was undoubtedly aware of the possibilities of the use of saccharin in maintaining production of essential food-stuffs, and this no doubt would be taken into account when allocating the present sugar rations to manufacturers.

(6) If saccharin is to be used essentially for making into tablets, is there sufficient machinery and labour available to make the necessary quantity to meet even a proportion of the public demand for such tablets?

(7) Is not the new Order likely to imcrease the activities of the black market?

(8) In view of the exceptional concentrations of saccharin, many food-stuff manufacturers would encounter the greatest difficulty in incorporating this into their products. The baker, confectioner, ice cream manufacturer, etc., requires a sweetener which gives a certain amount of bulk, or enables him to make up the lost weight occasioned by the use of saccharin solution in place of sugar.

Yours faithfully,
CUMMING PARSONS, LTD.,
F. FARAGE,
Director.

Rat—Fifth Columnist

DEAR SIR,—There can be little doubt that the rat is proving the most damaging fifth columnist in our vital food industry. In a recent paper in the *Lancet* I laid emphasis on the need for a much more vigorous and better organised method of checking these rodents. We must, indeed, be grateful to the Ministry of Food and its rodent control department for the only really organised national rat campaign this country has known, but these are times of exceptional urgency, and one wonders if the very praiseworthy methods of the Ministry of Food could not be improved.

The methods adopted by the Ministry are sound in themselves. Some of its advisers are international authorities; improvement seems to lie in more power and scope for the individual rodent officers, and more compulsion with the public. A shortage of skilled rat-catchers led to plans to train women as rat-catchers, but one would have thought such work very appropriate for the Land Army, particularly as I have come across Land Army girls looking after a small greenhouse of azaleas and begonias for people of gentle birth who cannot get a male gardener.

The Ministry failed lamentably to show any more skill in propaganda than the rest of the Government departments. There have been complaints of insufficient co-operation from warehousemen, factory managers and other people. Where food reserves have been stored in buildings not normally handling foodstuffs, managements argued that they were not responsible for taking measures against the rats. In some blitzed areas I have been told that the local authorities have not co-operated sufficiently because their staff of full-time rat-catchers was helping with the avalanche of work connected with billeting, rehousing and other post-blitz headaches. If a big warehouse company is asked how many rat-traps it has for its six acres of buildings the reply is generally something like half a dozen or a dozen. If the management is told that it ought to have far more than that in each warehouse, the idea is usually considered to be ridiculous. Surely powers should be given to rodent officers to compel the use of fresh bait daily, sufficient traps for the local rat population, and for vermin-control rat-proofing of buildings to be part of the firm's work?

I understand that there is an association of vermin poison manufacturers and that contracts for vermin control are given only to firms which are members of this association. Such a monopoly does not encourage much individual enterprise. Red squill and many proprietary baits and poisons are now very difficult to obtain. With a virus the rats in an area generally become immune to it after a while, despite its earlier effects; the Ministry of Agriculture leaflet on rat control does not speak very favourably of the use of a virus.

Plenty of experience in trying to keep down vermin in warehouses or on a farm shows that there is the world of difference between routine advice and practical trapping experience. The average practical rat-trapper who has lived by results is ignorant of the biology of the rat, and probably could not write a leaflet for the Ministry; but one such man is worth more than several academic biologists when it comes to getting rid of rats. Is full use being made of such men? Hundreds of gamekeepers with a life's experience of vermin trapping were thrown out of work by the war. An important divisional rodent officer, recently telling me he was short of skilled rat-catchers, was most grateful to learn that the Gamekeepers' Association keeps a register of members in need of a job or a change!

Does the Ministry give scope to this individual skill and experience outside the firms in a favoured association? I understand that no rodent officer is permitted to use strychnine poisons, although one told me that it was the only way they could check the rats. Yet it is being officially recommended for moles in North Wales! The only other stuff to approach it in results is white arsenic. In America strychnine is the basis of vermin control because it does bring results. Admittedly it is dangerous and must only be used with great caution and skill.

Public co-operation in rat control is feeble, due to lack of compulsion by the authorities, and to the failure of propaganda. The film "Kill That Rat!" could have been put over to the public, the farmer and the business man in such a way that it made him do something about it. It merely makes him agree with it. What efforts have been made to distribute it? It was only by accident that I discovered I could borrow it free from the Central Film Library, but only in the 16 mm. version.

An effort should be made to discourage the public attitude to rat-catching as a loathsome job fit only for old and dirty men! The status of the rat-catcher must be raised by better pay.

The new Infestation Order, 1941, of the Ministry of Food, which came into operation in January, 1942, is a most useful step in the right direction, but it does not go far enough, and it can only achieve its full value if persistently and widely enforced. It must not be flouted—like the Rats and Mice (Destruction) Act, 1919.

Yours, etc.,
ERIC HARDY.

British Material for Export

Overseas readers are advised that the fact that goods made of raw materials in short supply owing to war conditions are advertised in FOOD MANUFACTURE should not be taken as an indication that they are necessarily available for export.

Recent Russian Food Research

Among other investigations recently carried out by Russian scientists is the important one connected with the conservation of vitamin C in soups for the workers, particularly on collective farms, as *borschtch*, the Ukrainian soup, represents an essential part of the diet.

A method of preliminary destruction of foodstuffs for the electrocolorimetric micro-determination of arsenic.

The electrocolorimetric method for the determination of arsenic contained in foods and beverages is proposed by A. I. Stenberg (*Problems of Nutrition*, x, **2**, 1941). The results obtained by applying partial destruction preliminary to estimation are no less exact than determinations carried out after complete destruction of the examined material. Methods are discussed for treating such products as meat, fish, flour and flour products, milk products, etc. For the estimation of arsenic contained in vegetable oils and animal fats with normal acidity, like butter, sunflower oil, etc., it is proposed to obtain an ether extract from the examined material; from this extract arsenic can then be extracted with alkali. Hot alkali solutions from the fat or oil can also be used, and arsenic directly estimated in this solution. Short hydrolysis and rapid oxidation of sugars is proposed for the treatment of sugar products and beverages such as sweets, preserves, jam, syrup, fruit juices, etc.

Analyses as suggested by the author take about 3 to 4 hours; for flour and flour products approximately 5 hours. A similar method can be applied for the estimation of arsenic contained in animal tissues. It is concluded that the use of the straight arsenic determination—*i.e.*, without preliminary partial destruction of the analysed material—allows only the estimation of a part of the arsenic contained in the products.

The reaction of the ring-precipitation in the examination of meat infected by Bacillus suipestifer.

The preparation of serum from rabbits immunised to *Bacillus suipestifer* is described by V. P. Ignatova (*Problems of Nutrition*, x, **1**, 1941). The serum which is thus prepared contains " precipitin ", which precipitates from solution the protoplasmic protein peculiar to the bacteria previously used as the antigen. Furthermore, physiological solutions of *Bacillus suipestifer* (antigen) are made up, finally boiled in the water bath at 100° C. for 30 minutes, and subsequently centrifuged until completely transparent. The precipitation reaction is carried out at room temperature, and is observed to take place 2 to 20 minutes after the precipitating serum and the antigen preparation have come into contact. The precipitating sera can be kept sterile if stored in glycerine (1 : 1) at 4° C. in the refrigerator. The precipitating quality of the serum remains active for a year under these conditions, and is specific. After having carried out various experiments on artificially infected meat, the author investigated the value of the described method applied to naturally infected meat. Extracts were made from meat taken from liver, spleen, heart, marrow, etc., of various animals infected by *Bacillus suipestifer*. The extracts were boiled in the water bath for 20 minutes at 100° C. after having been carefully prepared in sterile physiological solutions. Thirty-seven of 100 examined samples were found to contain *Bacillus suipestifer*. For comparison, analyses by the ordinary bacteriological method were carried out, side by side with the serological method. The following valuable results were obtained: Out of 37 positive results (=100 per cent.), 28 samples (=75·6 per cent.) gave positive results according to the serological method, and in 24 cases (=64·8 per cent.) results obtained with bacteriological and serological determinations coincided. The high percentage of identical data recorded by the two different methods speaks plainly for the practical value of the described method.

The influence of the preparation of vegetables on the vitamin C content of soups.

The composition and preparation of the Ukrainian soup *borschtch*, which is made out of a number of vegetables cooked together, is discussed by I. J. Soloveichek and P. A. Vasiluk (*Problems of Nutrition*, x, **2**, 1941). Particularly on collective farms, this soup represents an essential part of the workmen's diet, not only for the calorific value of the food, but also because it is important for its vitamin—especially ascorbic acid—content. The authors carefully investigated the method of preparation of the soup in order to find out whether the maximum of the available vitamin C was preserved in the soup until this reached the consumer. It was, however, found that in some cases as much as 70·8 per cent. of the vitamin was lost before the soup could be eaten by the worker. The chief cause for these considerable losses in vitamin activity was discovered to be the fact that the soups were prepared and transported to the workers in open or badly closed containers, and that finally the meal had to be rewarmed on the spot, entailing a further serious loss in vitamin content. Various methods to remedy these shortcomings are suggested.

Preparations of margarine and butter from cream with the help of a colloid mill.

Methods are described by N. I. Kosine and S. M. Bezsonov (*Problems of Nutrition*, x, **1**, 1941) for the use of a colloid mill in the production of synthetic foods of the " butter " type. It is observed that under certain conditions butter-like products can be prepared from emulsions composed of milk, fat and water; this " butter " is said to have a better taste and constitution than ordinary margarine. It is also stated that production is very economical.

The adjustment of a number of factors is necessary for the successful preparation of the food. The most important were studied by the authors—*i.e.*, temperature, fat content and total composition of the emulsion.

(1) Results show that if the colloid solution leaving the mill has a higher temperature than that of the fat, butter does not form. The emulsion has to be cooled (preferably to 5° C.). In this connection it is also said that the longer the emulsion is left at low temperatures,

the lower is the percentage of fat remaining in the buttermilk.

(2) If the fat dispersion in the emulsion is too high, butter cannot be prepared; 45 to 55 per cent. of fat in the emulsion is said to represent a satisfactory proportion.

(3) Emulsions obtained by using complete as well as skim milk are shown to give good results. Forty per cent. fat for 60 per cent. milk is used in several successful experiments; it is furthermore demonstrated that the milk of an emulsion can be collected from the buttermilk and re-used two to three times for the preparation of new emulsions. Still more complete and economical use can be made of the milk if it is suitably diluted with water.

E. R. P.

Campden Research Station

In his annual report for 1940 the Director, Mr. F. Hirst, M.Sc., A.R.C.Sc., in referring to the investigation of the practical problems connected with the preservation of food under war conditions, and research work carried out at the station, points out that individual members of the staff have been called upon in an advisory capacity by the Ministry of Food and to assist in the preparation and administration of the Fruit and Vegetables (Canning) Order, 1940.

Research and experimental work included the following subjects: Hydrogen Swells; Drained Weights; Final Densities; Changes in *p*H; Ethylene Ripening of Plums; Bottling Tests on Vegetables; Texture of Processed Peas; Heat Penetration: *Byssochlamys Fulva*.

Control of Sweetness

A paper by Mr. W. B. Adam gives details of the control of sweetness in view of the conservation of sugar supplies. The first point to be considered was how far the density of syrups might be reduced before canned fruits became unpalatable to the average consumer. This level varies for the different fruits and is probably about 20° Brix for the least acid (*e.g.*, sweet cherries) and about 35° Brix for the most acid fruits (*e.g.*, loganberries, damsons and under-ripe plums).

Sugars other than Sucrose

The sweetness of pure anhydrous dextrose has been fixed fairly accurately at 74 to 75 compared with sucrose at 100, but there is much less agreement about the sweetness of fructose. Published results vary between 103 and 175, the latter figure having for a long time been accepted as a standard. If it is agreed that dextrose is 75 and fructose 175, the figure for invert sugar is 125.

Dextrose (*Glucose*).—Glucose contains about 80 to 85 per cent. solids, of which about 35 per cent. is dextrose and maltose. Its sweetness, compared with sucrose (100) is only about 20 to 25, and it is useless for increasing the sweetness of canned fruits. A new glucose syrup known as "sweetose" contains about 55 per cent. of dextrose and maltose, and has a comparative sweetening power of about 40. Another commercial product called "cerelose" consists of pure solid dextrose. Solid dextrose may be added as a substitute for one-quarter of the sucrose used, according to American practice, but complete substitution of sucrose by dextrose may give rise to undesirable flavours.

Lævulose (*Fructose*).—This may be obtained by the hydrolysis of inulin, which occurs in artichokes and dahlia tubers, but its addition to canned fruits is not a practical proposition as it is not readily available commercially. It is the sweetest of the sugars.

Invert Sugar.—Tasting tests made on fruits canned with syrup inverted by boiling with 150 ml. of normal hydrochloric acid per gallon of syrup, the acid being afterwards neutralised with caustic soda demonstrated that little difference could be distinguished between the inverted samples and the controls.

Sweetening Agents other than Sugar

Saccharin.—Saccharin is relatively insoluble in water and the more convenient form for general use is so-called "soluble saccharin," which appears to be about eight or nine-tenths as sweet as saccharin, according to tests on gooseberries, etc. When saccharin or soluble saccharin of 10° conventional equivalent of sweetness were added to a syrup of 30° Brix it did not, in fact, raise the sweetness by more than 7 or 8°. When soluble saccharin of 10° conventional equivalent of sweetness was substituted in a syrup of 30° Brix it also showed a sweetening power of only about 7 or 8°, and, as in the previous case, did not produce any foreign flavour. Attempts to replace a larger proportion of the sugar by soluble saccharin resulted in the introduction of bitter flavours.

Dulcin (p-*phenetylcarbamide*).—This substance may be used to increase the sweetness of canned fruits from the equivalent of 30 to 40° syrup, or to replace about 10° of a 30° syrup. Larger proportions produce foreign flavours.

Alteration of p*H*.—Reduction in total acidity or increase in *p*H can be readily detected by the palate and experimental evidence obtained at Campden indicates that total acidity is quite as important as *p*H in this respect. Preliminary canning tests with alkaline buffers to alter the *p*H and to alter the total acidity (and *p*H) by the addition of sodium hydroxide gave some idea of the limits beyond which foreign flavours become very pronounced and titrations of untreated samples of the canned products enabled some indication to be obtained of the optimum quantities of sodium hydroxide to be added. The effect of alkaline buffers is described in detail.

Total Solids in Tomato Puree

In a paper by G. Horner a procedure is described which can be readily carried out in any analytical laboratory and which should give easily reproducible results. On account of the rapidity with which it can be conducted it is suitable for factory control, and if it were generally adopted the risk of disagreement between manufacturers, buyers and Public Health Authorities would be avoided.

In the author's opinion, the refractometric method offers considerable advantages over drying of distillation methods and the procedure finally recommended is given.

News from the Industry

Nation's Food Storage

The hundredth food store—single-storeyed buildings each covering an area of 25,900 sq. ft.—has been completed by the Ministry of Works. Forty more—the beginning of a new programme of 127—have been put in hand.

In these 100 camouflaged buildings of pre-fabricated steel, concrete floor, brick walls, steel and corrugated asbestos roof, dotted about the country is storage space for something like 1,000,000 tons of the nation's reserve food and raw supplies.

The 100 buildings have been completed in eight months. Each cost £10,000 to £11,000 to build.

* * *

Vitamins for Pharmaceutical Purposes

Major Lloyd George informed Captain Elliston on January 20 that there were no restrictions on the use of vitamins B_1 and D for pharmaceutical purposes. It was not possible to increase the present supply of D owing to the large demands for this vitamin for the fortification of margarine. In regard to vitamin C there was no restriction on the use of ascorbic acid for tablets and other "straight" preparations. There was, however, a voluntary restriction with the manufacturers whereby pharmaceutical manufacturers of proprietary brands of multi-vitamin preparations were allowed supplies of ascorbic acid on the basis of their average usage in the first five months of 1941 before the introduction of the Vitamin C Control Order on June 2 last. This restriction had been imposed by the Minister of Food with the agreement of the Minister of Health, on the recommendation of a special Diets Advisory Committee of the Medical Research Council.

* * *

Milling Oats Surplus

Recent heavy threshings of oats in Scotland have resulted in a surplus over immediate requirements. To relieve congestion and to safeguard supplies the Ministry of Food will buy and hold in Scotland a reserve of milling oats.

Scrap Metal Sweep

Lord Reith, Minister of Works, announced in January that his Ministry had undertaken, at the request of the Minister of Supply, the job of sweeping the country from end to end of steel and iron scrap, large and small.

The need for scrap recovery is urgent. It is hoped to get 40,000 tons a week from this national drive, to be handed over to Lord Beaverbrook for steel works. In addition to the normal supplies of scrap which arrive through scrap merchants, who will carry on their business as hitherto, Ministry of Works are starting an intensive drive.

The campaign will fall roughly under three heads:

(*a*) A national survey of all idle iron and steel in lots of over 3 tons in any one place. This survey is being accelerated and it will be made compulsory to disclose all such metal.

(*b*) Clearance of local dumps to which lots of less than 3 tons should be sent as quickly as possible.

(*c*) Acceleration of the collection of railings.

Mr. G. M. Carter, of Messrs. George M. Carter Erectors, Ltd., of Newcastle, has been appointed Director of Demolition and Recovery and is in charge of all this work for the Minister of Works.

* * *

Ministry of Food—Correction

In FOOD MANUFACTURE, February, page 44, it was stated that Mr. Percy Dalton, Managing Director of Stokes and Dalton, Ltd., had been appointed Chairman of the Rusks Section of the Bread Division of the Ministry of Food. The Ministry of Food has pointed out that there is no such section of the Ministry's Bread Division and consequently no such appointment has been made.

We are informed however, that an Association of Rusk Manufacturers has recently been formed with Mr. Dalton as Chairman.

Paper Salvage Facts

1 newspaper would make three 25-pounder shell cups.
1 popular magazine would make interior components of two mines.
6 old books would make one mortar shell carrier.
1 soap powder canister would make four aero engine gaskets.
5 medium-sized cartons would make one shell fuse assembly.
60 large cigarette cartons would make one outer shell container.
20 breakfast cereal cartons would make one case for 3-pounder shells.
6 old bills would make one washer for a shell.
4 assorted food cartons would make one box for aero-cannon shells.
1 old envelope would make one cartridge wad.
12 old letters would make one box for rifle cartridges.

* * *

Control of Containers

The Minister of Supply has made the Control of Tins, Cans, Kegs, Drums and Packaging Pails (No. 5) Order, 1942, which came into force on January 19.

The Order consolidates previous Control of Tins and Cans Orders and extends the provisions of the No. 4 Order to cover sheet steel containers. In order to achieve greater economy in the consumption of steel, kegs and drums for use in the home civil trade must now conform to wartime standards and specifications laid down in schedules drawn up by the British Standards Institution. Returnable containers may now be used only for the commodities for which they are prescribed in the schedule so long as they are serviceable for carrying those commodities. Returnable containers which are no longer serviceable for the commodities for which they are prescribed must be filled to capacity when used for other commodities for which they may be serviceable.

In future, metal caps and enclosures may only be printed in one colour and tobacco tins may

only be printed either on the lid or on the body in not more than two colours.

Copies of the Order may be obtained from His Majesty's Stationery Office, York House, Kingsway, W.C. 2, or through any bookseller.

* * *

Calendars and Diaries

Despite difficult conditions, we received some remarkably well got up calendars and diaries.

Among the calendars there were attractive ones from Arthol Manufacturing Co.; M. Hamburger and Sons; Crack Pulverising Mills; Crofts; Johns, Son and Watts; British Vegetable Parchment; J. H. Sankey; the Vase Press; Staffords the Printers; Advanx Tyre and Rubber Co. Pty.; Chuit, Narf and Co., Geneva; Standard Synthetics; and Tullis Russell and Co., Ltd.

Pearlite Box sent a useful substitute for their desk diary and memo pad. From Rex Campbell came a very well done desk pad with diary and memo space.

Among the diaries received were those from Bayer Products; British Parchment Mills; W. J. Bush; Elliott Brothers (London), Ltd.; Ch. Goldrei, Foucard and Son; and Farmers' Marketing and Supply Co., Ltd.

* * *

Glucose Ousting Sugar

The increased production of dextrose in the form of corn syrup in America is giving concern to the cane sugar producers, according to *International Sugar Journal*. The cane sugar producers have been demanding control of dextrose production because it has displaced an enormous quantity of cane sugar in the preparation of preserves.

The account continues: "Originally this use of dextrose was comparatively negligible, mainly because consumers believed that preserves prepared with corn syrup were inferior in quality to those made with cane syrup. However, with the discovery and boosting of certain vitamins in corn syrup the production and consumption of dextrose has increased by leaps and bounds, and its uncontrolled production is claimed to be competing unequally with that of cane sugar, which labours under many restrictive measures."

Post-War Perils

In a statement by the Right Hon. R. McKenna, Chairman of Midland Bank, Ltd., which was prepared for the annual meeting of shareholders, he said, after reviewing past and present problems, that we must not forget that there may be many post-war perils ahead of us. Last time the worst excesses of overspending, inflation, speculation and capital expansion came not during, but shortly after, the war, with disastrous consequences that are still remembered. The risk of a similar catastrophe after this war may be all the greater in that restrictions have been more severe. Accordingly there should be no hasty abandonment of necessary controls in finance, particularly of the capital market and of foreign exchange transactions. The natural predisposition to get rid of all restrictions as soon as the war is over must be resisted. We must profit by experience in using to the full the essential driving force of individual enterprise in the post-war conditions the general shape of which experience may help us to foresee. If we are wise in our perception of the proper limits within which freedom and control should respectively operate, a financial system can be evolved which will be a powerful factor in the creation and maintenance of national well-being.

* * *

W. J. Bush and Co., Limited

Mr. H. B. Bush has been appointed a managing director of W. J. Bush and Co., Ltd., London, while Mr. C. F. Bush and Mr. A. J. McIntyre have been appointed directors.

Mr. D. E. Arnold, F.C.I.S., has been appointed secretary to the company.

* * *

The Caldecott Community

Her Majesty the Queen has graciously sent a gift of £100 to Lord Lytton, the Chairman of the Caldecott Community. Her Majesty has taken an interest in the Community for several years. Recently a public appeal was made for Caldecott. The expenses of the appeal were defrayed by Mr. Percy Dalton, the organiser of a record war weapons week at Ilkley, where he lives.

More Tinned Perch

The movement towards taking advantage of the native wild foods is worthy of praise and encouragement. Some months ago, English eels were canned and now a big extension of the scheme of trapping perch for the purpose of turning them into human food, which has proved extremely successful at Lake Windermere, is planned for the coming spring.

The chairman and managing director of a Leeds canning firm handling this fish told *The Yorkshire Post* that valuable scientific work had been carried out, and the trapping of perch was being organised on a large scale.

"We are going to fish in some ten lakes next spring, including Bassenthwaite, Derwentwater, Haweswater, Windermere, Grasmere, and Rydalwater," he continued. "We also expect to fish in a number of large city reservoirs in Scotland and England. Last season we turned out 200,000 tins; and in April and May of this year we expect to reach from 2,000,000 to 3,000,000 tins. This is a commercial proposition which should prove very profitable for those who are concerned with it in the Lake District."

* * *

Physicists' Planning Committee

The board of the Institute of Physics has appointed a Planning Committee with the following terms of reference:

"To watch and to advise the board on matters affecting physics and physicists, including their education and training, and on post-war planning."

The constitution of the committee, which has power to co-opt, is as follows: Professor Sir Lawrence Bragg, Professor J. A. Crowther, Mr. E. R. Davies, Dr. H. Lowery, Major C. E. S. Phillips, Dr. C. Sykes, Dr. F. C. Toy.

At the request of the board the committee will proceed at once to consider certain matters concerning the education and training of physicists.

Close contact will be maintained with the participating Societies of the Institute, namely the British Institute of Radiology, the Faraday Society, the Physical Society, and the Royal Meteorological Society, as well as with other bodies concerned with the application of physics to industry.

Liebig's Extract of Meat Company

At the seventy-seventh Ordinary General Meeting of Liebig's Extract of Meat Co., Ltd., Mr. Kenneth M. Carlisle, chairman and managing director, presided, and in the course of his remarks said that the balance of net profit available for distribution is £215,000 in comparison with £232,000 in the previous year. The reduction fails to reflect in true perspective the trading profits of the group of companies, which, notwithstanding reduced margins owing to rising costs of production have nevertheless been large, nor the volume of trade in which they have been engaged during the past year, which has surpassed all previous records; but it does connote in no uncertain measure the levies of taxation and the provision it has been considered necessary and prudent to make against eventual liability in this connection on the profits earned.

Indeed, it is not without considerable disappointment to us that in a year in which the tide of the company's trade and earnings has swept to the highest floodmark attained in its long history the surplus actually left available for distribution, after providing for taxation, should figure at the lowest ebb touched since the crisis year of 1931.

Our overseas canning factories have again been fully engaged to the limit of their capacities and in consonance with the supplies of cattle and other raw materials available, mainly in the production of canned meats and other foodstuffs for military and Government requirements. They have had difficulties and setbacks to contend with in connection with delays and shortages in the deliveries of packing and other materials, but on the whole have come through well.

On the farming side of our business results have, as is customary, been patchy, but when regard is had to the widespread areas covered and the variable climatic conditions under which operations are conducted, irregularity in performance is only to be expected. Generally speaking conditions have been unpropitious, due to excessive rainfall, but in the aggregate improving values of livestock and an active market have contributed towards offsetting the rather disappointing calving and mortality returns of some districts. The stancias have as usual fulfilled the useful function of supplying cattle for the factories.

* * *

Rio de Janeiro Flour Mills and Granaries

At the fifty-sixth Annual General Meeting of the Rio de Janeiro Flour Mills and Granaries, Ltd., the chairman, Mr. S. C. Sheppard, said the board recommended a final dividend of 1s. per £1 stock, less tax, making a total dividend for the year of 8 per cent., less tax, leaving the carry-forward £926 higher. The past year had been full of difficulties, but it was considered that Brazil had been more than fortunate in being able to so fully participate in the cheap wheats from Argentina, enabling the company to provide low-priced flour and bread without any State subsidy, as was the case in so many other countries throughout the world. Thanks also to the improved economic position in Brazil remittances had been more freely distributed, by which the accounts had benefited accordingly.

Like many other countries, Brazil had not been backward in the levying of new forms of taxation, which, together with their depreciated currency, had materially increased the cost of living. This in turn had called for higher salaries, wages and other expenses, all of which had largely added to the general cost of working in the local industries.

As to the future, the chairman said he could not help but feel hopeful. This was confirmed by a cable he had just received from the general manager, which read: "Business conditions considered satisfactory and future prospects promising."

The report and accounts were adopted.

* * *

N.Z. Ford Dealers

Mr. W. J. Jordan, High Commissioner for New Zealand, has paid £1,250 to the Ford Emergency Food Van Trust of Dagenham, representing a subscription by the Ford dealers of New Zealand.

Dr. C. C. Paterson

It is announced by the General Electric Co., Ltd., that Dr. C. C. Paterson has joined the board. From 1901 to 1918 Dr. Paterson was at the National Physical Laboratory with Sir Richard Glazebrook, where he was Principal Assistant responsible for Electrotechnical and Photometric Departments. He then joined the G.E.C. to establish and direct the research organisation which up to the beginning of the war had grown to number over 500 people, and to be amongst the largest in the country. Dr. Paterson is a past-president of the Institution of Electrical Engineers and other bodies, and is chairman of the Electrical Industry Committee of the British Standards Institution.

* * *

The Distillers Company, Limited

The General Works Department (England) has removed to its former offices, on the third floor of 21, St. James's Square, S.W. 1. All correspondence should be addressed to The Distillers Company, Ltd., General Works Dept. (England), 21, St. James's Square, London, S.W. 1. Telegrams: Genworkdep, Piccy, London. Telephone: Whitehall 9561.

* * *

OBITUARY

Mr. James Crompton Holt

We regret to announce the death of Mr. James Crompton Holt, of Brooklyn, Castleton, Lancs, after a very short illness. Mr. Holt was a director of Messrs. Brierley, Collier and Hartley, Ltd., which firm he joined forty-six years ago at the age of sixteen.

A son of Mr. Thomas Holt, J.P., of Castleton, he originally joined Messrs. Luke Collier and Sons, Ltd., and became manager and a director of that firm. When the business was amalgamated into Brierley, Collier and Hartley, Ltd., he joined the board of the larger concern.

Mr. Holt had many friends in the confectionery trade, and his funeral was attended by about one hundred of the employees, staff and directors of the firm he served so long.

Homogenisers for the Food Industry

Homogenisation is of great importance in the food industry, and the ability to fit into line production is a big advantage of the Weir Homogeniser, which does not require time to treat material in batches. It is a three-throw plunger type emulsifier which forces the liquid or paste under treatment through a valve of special construction at very high pressure. This breaks down the mixture into extremely small particles, and if it has either a natural or added stabiliser the resulting product will remain homogeneous.

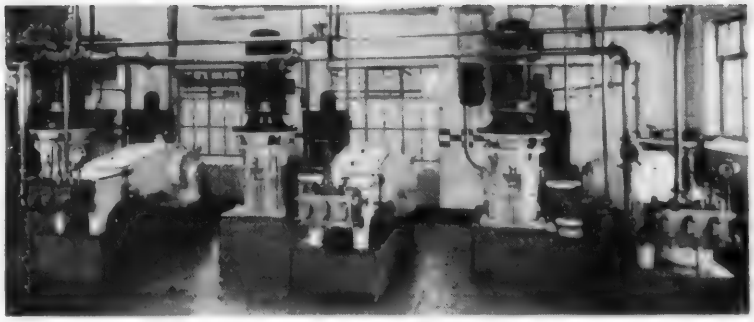
The homogeniser is strongly constructed to stand the extremely high pressures involved, and all parts coming in contact with the product are of acid-resisting stainless material. An essential part of the design is accessibility for cleaning purposes, and, to avoid contamination, no plunger packing is used. Its use for milk, cream, foodstuffs and pharmaceutical preparations has resulted in more palatable products greatly improved in appearance and flavour.

G. and J. Weir, Ltd., who are the largest firm of pump makers in the country, make the homogeniser in standard sizes covering a wide range of activities, and suitable for motor, belt or steam drive.

* * *

The Largest Evaporators yet Constructed

Four welded evaporators constructed by G. A. Harvey and Co. (London), Ltd., Woolwich Road, London, S.E. 7, to the order of Tate and Lyle, Ltd., Plaistow, using "Fleetweld" Electrodes, manufactured by the Lincoln Electric Co., Ltd., are of particular interest, as they are claimed to be the largest welded pressure vessels so far made to Lloyd's Class I Code. They have a length of 26 ft. 9 in. with an internal diameter of 11 ft., and are designed for a working pressure of 250 lbs. per sq. in. Each of the evaporators consists of two shells, 10 ft. 4 in. high, and a domed bottom and cover 3 ft. deep. The bottom shell, known as the Calandria section, is 1·15/32 in. in thickness and has two tube plates each in one piece 1 in. thick.



Three 750-gallon per hour Weir Homogenisers installed at a dairy.

There are 1,792 tubes of 1½ ins. diameter, 9 ft. ¼ in. long, welded into and connecting the two plates. The thickness of the top shell is 1⅛ ins. and that of the bottom and top dished and flanged ends 1⅜ ins., the plates for these ends had a diameter before dishing and flanging of 18 ft. 5½ ins.—the maximum width that can be rolled in England. The Calandria section was tested to 375 lbs. per sq. in. and the upper shell to 285 lbs.

* * *

Ultra-Violet Rays—Speed up War Freights

The use of ultra-violet rays and a special type of fluorescent chalk is speeding up the handling of war freights at L.M.S. marshalling yards throughout the country.

The blackout slows up the work on the railway, even though a certain amount of lighting is permitted to assist operations. The work of breaking up and reforming freight trains in marshalling yards is one of the activities affected by lack of lighting. The principal difficulty has been the inability of reading the chalk numbers placed on the wagons to indicate to the shunter into which siding the wagon has to be placed.

Experiments conducted by the L.M.S. Railway have resulted in this particular difficulty being overcome. Recently an important L.M.S. marshalling yard was equipped with ultra-violet ray lighting, the beam of which is directed down the hump over which the wagons are shunted, the wagons being marked with a special type of fluorescent chalk.

The action of the ultra-violet ray on this special chalk activates its fluorescent properties and results in the numbers glowing whilst the wagon is in the ray, thus enabling the shunter readily to read the number and shunt the wagon into the right siding.

The experiments have proved so successful that the use of ultra-violet rays and fluorescent chalk is being extended to other yards where difficulties in reading chalk numbers exist.

* * *

Automatic Valves

As man-power and woman-power problems become more and more matters of urgent concern for every British industry, manufacturers are awakening to a vivid appreciation of automatic machinery. This is not, of course, an appropriate time for large-scale installations of new plant. But how many firms realise how much in human labour and human error can be saved by such a simple improvement as installing automatic valves? All gases and fluids, and both temperature and humidity, can be controlled by valves. And, by using valves of the types made by the Magnetic Valve Company, this control can become wholly automatic. The principle of magnetic valves is essentially simple and foolproof, and the benefits of automatically maintained or controlled temperature or humidity are obvious. Informative literature is available from the company.

* * *

British Chemical Plant

We have received a copy of the 1941 edition of the Official Directory of the British Chemical Plant Manufacturers' Association. The directory is issued gratis to enquirers genuinely interested in the purchase of British chemical plant.

Post-War Economic Food Problems

At the request of Lord Woolton, Mr. W. F. Crick, Economic Adviser of the Midland Bank, has been released by the bank for part-time service at the Ministry of Food, for the special purpose of studying and advising upon post-war economic problems arising from the work of the Ministry.

* * *

X-Ray Analysis in Industry

The Institute of Physics is arranging a conference on "X-Ray Analysis in Industry", to be held in Cambridge on April 10 and 11 next. The purpose of the conference is to promote the interchange of knowledge and experience between those employing X-ray analysis (diffraction methods) in their work in different fields and to arrange for further collaboration between physicists, engineers, chemists and others towards the solution of problems by its methods.

During the conference the President, Professor Sir Lawrence Bragg, will lecture on "The History and Development of X-Ray Analysis". Further particulars can be obtained from the Secretary of the Institute of Physics, temporary address at The University, Reading, Berks.

* * *

New Chemical Apparatus

Recently produced for the food industry by Townson and Mercer is a new model of Chance's "Hysil" Bolthead flasks in 10 and 12 litre sizes, with slightly tapered necks. These give a really firm hold with moulded rubber bungs. To go with them, moulds have been put down for all bung sizes up to 4½ ins., which will be found useful for many manufacturing purposes.

Of interest are glass coils in heat-resisting glass in diameters up to 2 ft. 6 ins. and tube diameter up to 1½ ins. The necessary concentric tanks into which they fit are being produced.

Phœnix Funnels reduce filtering times in general by half, but are only suitable for analytical work.

A new type of filtering material, composed of accurately graded particles of porcelain fused together to form tubes is being developed. It is possible that at a later stage this will be available as filter crucibles as well, but they already have controlled porosities and are proving extremely valuable for large-scale filtration or aeration.

Among other items are: A new precision analytical balance, of the very highest workmanship, which is available at present with fairly quick delivery; a wide variety of manometric pressure and vacuum gauges and a range of thermostatically controlled apparatus; and a new power control variable cycle valve relay which can be applied to many pieces of existing thermostatic equipment, to give vastly superior results.

* * *

Canteens for Cold Storage Industry

The Ministry of Food announces that canteens serving industrial workers employed in the cold stores operated as part of the Ministry's Cold Storage Control Scheme by members of the National Cold Stores Committee may now obtain supplies of food on the special scale of allowances recently laid down for Category A Industrial Group canteens.

These canteens have previously been included in Category B Industrial Group and received special allowances, but on a lower scale than that applicable to Category A canteens. They will now obtain the benefit of the higher scale and the necessary instructions have been issued to local Food Offices.

* * *

Ford Vans to Feed School Children

The food-carrying vans, presented to the country by Mr. Henry Ford, are to be used in the Government's national plan for feeding school children. Already they are being used in Bath to provide cheap meals, and their work is expanding rapidly.

The meals are cooked in central kitchens set up by the Ministry or the local authorities, and are delivered to schools some distance away in the Ford vans by means of the insulated containers which are part of the equipment. These containers are capable of keeping food hot for at least three hours.

The vans are part of the fleet of over 400 mobile food units owned by the Ford Emergency Food Vans Trust, set up to administer the funds given by Mr. Ford and his son for the purpose of providing hot food under war conditions. Their use in Bath is but one example of the valuable service they are performing. In other districts they are being used to provide hot meals for employees in vital war factories and for farm workers.

* * *

Twenty-One Years' Work

The National Institute of Industrial Psychology, whose annual report has been issued, has just completed twenty-one years' work.

Founded at the end of the last war for the study of the psychological aspects of occupational problems the Institute has since, often under difficult conditions, carried out investigations in industry, and has advised some ten thousand young and older people on their choice of occupation. It has undertaken research both on industrial and vocational problems and has furthered interest in the subject by lectures and publications.

The outstanding feature of the present twenty-first year, however, has been increased general recognition of the principles which the Institute has advocated. This is reflected in the fact that the services of almost all of its technical staff have been called for in connection with work for the fighting services.

For the War Office and the Admiralty this work is in relation to the selection and allocation of recruits. For the Air Ministry the Institute has assisted with problems of gunnery and flying training.

A section of the report devoted to industrial work during the year shows that the Institute's investigators have been busy with such questions as the recruitment and selection of operatives, methods of reducing absenteeism, training, the use of non-financial incentives, the organisation of works councils and other matters closely affecting efficiency and morale.

Information and Advice

Fish Pastes

7,513. *Have been subscribing to your magazine for the past few months and have found some very interesting and helpful information in it.*

At the present time we manufacture quite a wide range of different types of meat sandwich spreads, and have decided to branch into bloater and other fish pastes for sandwiches.

Would appreciate it very much if you could let us know where we could get information on this. (Vancouver.)

We are glad that you are finding our journal interesting and helpful. There are, of course, many varieties of paste, and we are giving you herewith some recipes which may help you to develop your own, and are merely in the nature of suggestions, as each manufacturer works out his own formula. The choice of ingredients is a matter which is largely governed by the consideration of price and type of market.

Here are two suggestions :

SALMON AND SHRIMP PASTE

Salmon	50 lb.
Bacon fat	12 ,,
Shrimps (skinned)	10 ,,

Flavour with sugar, cayenne, white pepper and ground mace.

BLOATER PASTE

Bloaters	24 lb.
Bacon fat	16 ,,
Salmon	12 ,,
Anchovies	12 ,,
Rice flour	4 ,,

Add butter for high-class product and flavour with pepper and nutmeg.

Ingredients are minced and mixed well. The pots are filled to the top to exclude air; caps are rolled on and the jars sterilised at 230° F. to 240° F. for 30 to 40 minutes in case of 3-oz. jars and longer for larger jars.

Evaporated Apple Rings

7,544. *We would value any information you could get us regarding procedure and process necessary in preparing and evaporating apples.*

Our idea is to make something to take the place of evaporated apple rings formerly imported. Any information will be gratefully received. (Largs.)

Here are some data supplied by an expert who has worked in the industry :

First remove the pellicle, core and slice apples. Throw the fruit into a water bath containing sulphate of alumins (10 lbs. to 100 galls. of water). The fruit is not left long in this, but long enough to accumulate a suitable quantity for the subsequent process.

The drying process requires appropriate plant and machinery, and you should get into touch with the makers—names given.

Information Supplied

7,431. *We are interested in synthetic casings and are most anxious to obtain casings of this kind. Will you kindly tell us the name and addresses of firms who make or supply these casings?* (Grantham.)

This was done.

7,433. *Will you kindly give us the names and addresses of manufacturers of potato flour?* (London.)

Name was given.

7,438. *Can you inform us the source or sources of supply of wire-lined paper strips, as sample appended?* (Oxshott.)

Names were suggested who might help to supply the nearest to sample, under wartime conditions.

7,447. *We are manufacturers of flavours and essences and are having tremendous trouble in getting supplies of raw materials, and would be very much obliged if you could acquaint us with possible suppliers.* (Belfast.)

Names were suggested but the position is rather difficult.

7,449. *I shall be glad if you will kindly let me know the names and addresses of the suppliers of plant in connection with potato drying. I have rollers already on site, but am anxious to get into touch with the manufacturers of the remainder of the plant.* (Brentwood.)

Names were given.

7,451. *Can you furnish us with the names and addresses of any firms supplying can openers, as used in canning factories, and small glass mercury thermometers to control the temperature of the contents of the cans?* (Maryport.)

This was done.

7,469. *We would be pleased if you could put us in touch with manufacturers of milk powder machinery. We have had quotations from America, but being British we should like British machinery if possible.* (Johannesburg.)

The names of some British firms were given.

Information Required

8,017. *We should be glad if you could put us in touch with any firm who make equipment for the manufacture of puffed wheat and puffed rice. Originally, we understand, these machines came from America; but that now one or two plants have been manufactured in this country. We are not anxious to be placed in touch with any firms who are prepared to go into the matter, but only with firms who have actually manufactured the equipment in question.*

7,511. *Would you please let us know if there is any economic substitute for citric acid powder, or tartaric acid powder in the manufacture of table jellies, crystal jellies and fruit squashes?* (Dublin.)

Recent Patents

These particulars of new patents of interest to readers have been selected from the "Official Journal of Patents", and are published by permission of the Controller of H.M. Stationery Office. The journal can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, price 1s. weekly (annual subscription £2 10s.).

Abstracts of Recent Specifications

An Improved Method of Preserving Fruit

The invention consists in the superficial application to the fruit of solutions of non-drying fatty oils in association with resins which may be natural or synthetic resins, oleoresins, balsams, acids derived from oils, higher aliphatic alcohols or esters of higher fatty acids or hydrocarbons of high boiling point in which the proportion of non-drying fatty oil is substantially greater than the proportion of resin or similar substance and is such that a waxy or greasy film is formed on the surface or skin of the fruit, the solution being free from any intentionally added permanently solid material.

The invention further consists in solutions as above defined suitable for use in the treatment of fruit and of such character that a waxy or greasy film will be formed on the surface or skin of the fruit. In some cases paraffin wax or oil may be used, but this necessitates the use of a solvent other than ethyl alcohol which does not injure the fruit, such as 80 parts of isopropyl alcohol + 20 parts of ethyl acetate, although the use of this particular mixture would not appear to be of commercial importance. Sterilising agents such as acetic acid and benzoic acid may be added.

If castor oil and shellac be regarded as typical constituents it is essential that the amount of castor oil be in substantial excess of shellac, and that in all cases the proportion of shellac be much less than the proportion previously proposed in order to avoid too thick and hard a deposit on the fruit, which is visible and detracts from its appearance and which may result in production of abnormal metabolic products.

It has been found that generally a ratio of oil to shellac of 2 to 1 is suitable, but variations within relatively wide limits from this ratio are permissible so long as the film formed on the fruit is of a waxy or greasy character.

A solution within the scope of the invention may consist of alcohol with 5 to 10 per cent. of castor oil and 2½ to 5 per cent. of shellac, to which may be added 1 per cent. each of acetic and benzoic acids.

This proportion of castor oil and shellac in solution may be regarded as representing substantially the upper limits, as generally the use of more dilute solutions is advisable, though the use of more concentrated solutions may in some cases be advisable.

The use of alcohol in the form of rectified spirit is normally to be preferred, if only on account of its relative purity.

Industrial methylated spirit which contains 5 per cent. of wood naphtha would not, however, normally be open to objection and no damage has been found to result from the use of mineralised (coloured) methylated spirit, although the mineral naphtha and pyridine content of such material may have an effect upon the flavour of the fruit treated.

541,007. *Ronald George Tomkins.*

Specifications Published

Printed copies of the full Published Specifications may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, at the uniform price of 1s. each.

541,048. AINLEY, A. D., DAVIES, W. H., and IMPERIAL CHEMICAL INDUSTRIES, LTD.: Insecticidal and fungicidal compositions.
541,119. HELLER, B. Method of preserving meat.
541,128. CELEC CORPORATION, LTD., and BAKER, A.: Extraction of an organic gelling compound from vegetable matter.
541,171. FISCHBACH, S., SIDLER, L. J., and ENQUIN, J.: Apparatus for the disinfection of vegetable products and the like.
541,225. FERGUSON, W. HAIG-, and FERGUSON, C. HAIG-: Boxes or cartons.
541,286. SMITH, A. R.: Filling machines.
541,291. GREAVES, R. L.: Water-heating apparatus.
541,315. SKINNER, D. B.: Apparatus for mixing liquids in substantially constant proportion.
541,357. DU PONT DE NEMOURS CO., E. I.: Production of glycerol.
541,386. BRITISH THOMSON-HOUSTON CO., LTD.: Apparatus for gas analysis.
541,449. ARMSTRONG, C. H., BROWN, N. H., and COPES REGULATORS, LTD.: Control of feed-water supply to boilers and generators.
541,453. BRITISH THOMSON-HOUSTON CO., LTD.: Refrigerators.
541,486. REISS, A., and REISS ENGINEERING CO., LTD.: Means for clearing boilers, flues, and the like.
541,488. ZWICKY, J. F., and AIR PORT EQUIPMENT, LTD.: Filtering devices.

Trade Marks

The list of trade marks of interest to readers has been selected from the "Official Trade Marks Journal" and is published by permission of the Controller of H.M. Stationery Office. The journal can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, price 1s. weekly (annual subscription £2 10s.).

ODOL.—613,707. Canned meat, canned fish, canned poultry, canned game, canned fruit, canned vegetables, meat extracts, fruit and vegetable preserves, cheese and pickles. **Oranbux, Ltd.**, 103 Westwick Street, Norwich; Manfacturers. To be Associated with No. 171,016 (783) xlviii and others.

TRUEXA.—615,140. Mineral and aerated waters and other non-alcoholic drinks; syrups and other preparations for making beverages. **Brookes Lemos, Ltd.** (a company incorporated in accordance with the laws of the Union of South Africa), 1, Spencer Road, Salt River, Cape Town, South Africa; Manufacturers of Food Products. To be Associated with No. 613,880 (3291) xxxii.

CRYSTALEX.—615,443. Gelatine for use as food or as an ingredient in food. **Union Glue and Gelatine Co., Ltd.**, Cransley Works, Garrett Street, Golden Lane, London, E.C. 1; Merchants. To be Associated with No. 442,397 (2384) i.

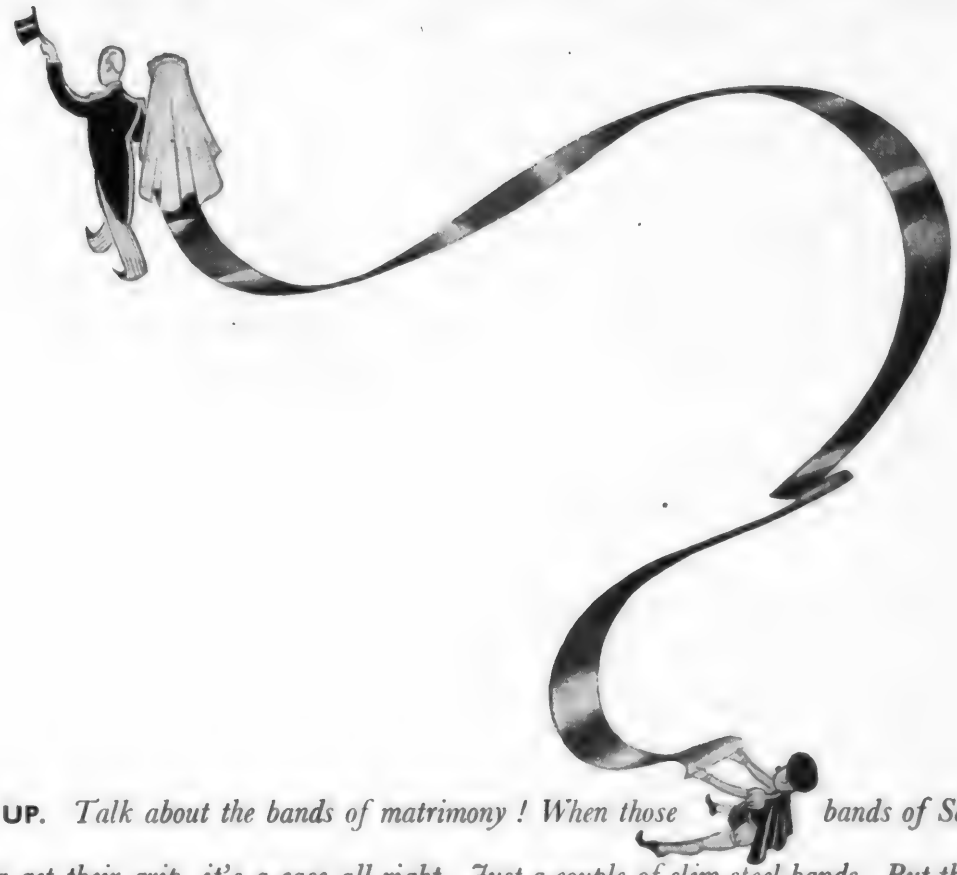
WITAMAID.—615,632. Cereals prepared for food, and tapioca. **T. W. Good and Son, Ltd.**, 94 and 95, Witham, Kingston-upon-Hull; Wholesale Grocers and Provision Merchants. To be Associated with No. 489,323 (2664) xlii.

New Companies

Candisco, Limited. (371287.) An organisation for the purchase, importation, sale and distribution of canned beans, etc. Dirs.: Representatives of the Minister of Food (not named). A. H. Hughes (chairman), J. M. Harrison and J. E. Hutchinson, representing H. J. Heinz Co., Ltd., Harlesden, N.W. 10; A. B. P. Roberts, repr. Poulton and Noel, Ltd., Southall; W. C. Campbell, repr. Crosse and Blackwell, Ltd., 20, Soho Square, London; L. Cooke, repr. the Co-Operative Wholesale Society, Ltd., 1, Balloon Street, Manchester; Ella H. Gasking and F. Hirst, repr. the other members; R. P. Spink (Chief Executive Officer).

Flour (Accessory Factors), Limited. (371321.) Mnfrs. of aneurin and any other substance intended to be used as human or animal food, etc. £100. Sub.: F. Hopton, 97, Cannon Street, E.C. 4 (clk.).

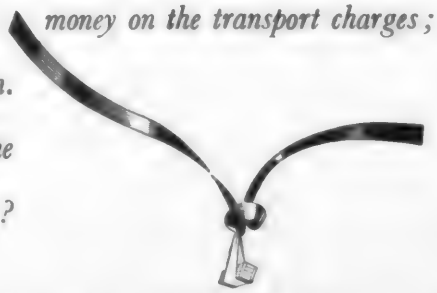
Taken from the Daily Register, compiled by Jordan and Sons, Limited, Company Registration Agents, 116, Chancery Lane, London, W.C. 2.



TIED UP. *Talk about the bands of matrimony ! When those* *bands of Seal-less Strapping get their grip, it's a case all right. Just a couple of slim steel bands. But they hold on like nobody's business. The packing case that gets in the grip of Seal-less is tied up for good. No need for nails. It's off on its journey and it will get to the end just as tidy and ship-shape as it started off.*

You'd think Seal-less Strapping would be dear, wouldn't you? In fact, of course, it's a darned sight cheaper than the old-fashioned way of nailing up heavy cases. You save money on the cases; money on the packers; money on the transport charges; ***and*** *you use the same cases again and again.*

Boys and girls use the Seal-less Strapping Machines on the biggest crates — and like it. Shall we show you how?



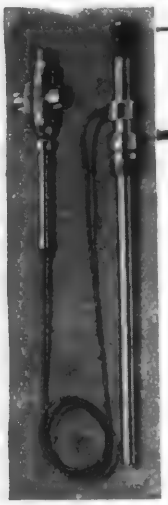
SEAL-LESS STRAPPING LTD., 19 SOUTHWARK STREET, LONDON, S.E.1: TELEPHONE HOP 1661-2

Non Electric

SARCO

TEMPERATURE CONTROLS

are self-operating, packless, thermostatic valves employing a UNIQUE principle which ensures positive control and reliability of operation. . . . Compact, simple and low in cost.
'Sarco' control ensures uniformity of product; prevents spoilage; saves fuel and labour costs.



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Controlling Air Heater Batteries for Dew point and Final Duct Temperature. "Wet Bulb" control for Humidity.

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For individual Cold-Room control on Brine Cooling Systems.

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Automatic thermostatic valves operating without auxiliary power. In eight sizes, in all-bronze, with rated capacities ranging up to 10,000 gals. per hour.

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  Process Work
- For by-passing on—
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  Milk Coolers
  Engine Jacket Cooling

For full particulars or advice on any problem in connection with Thermostatic control, apply Dept. 10F.

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SARCO THERMOSTATS LTD.

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metal-to-metal jointing

"Permac" joints on a Jacketed Pan

makes permanent yet easily broken joints!

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Telephone: Clerkenwell 3351 (2 lines) Telegrams: "Velsling," London

THE MOST PRACTICAL STORAGE METHOD

Tackle your shelving problems with Evertaut Steel Shelving. The simplicity and the speed with which this modern storing equipment can be erected and dismantled is a feature that is given greater value by the standardization of all component parts in the Evertaut range. Features include: Exceptional strength, rigidity and cleanliness. Resists flame, water and withstands vermin. Can be extended any time. Your factory needs Evertaut Steel Shelving—write for particulars to:

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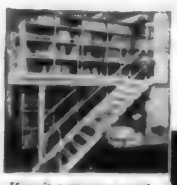
(Prop: J. B. Brooks & Co. Ltd.)



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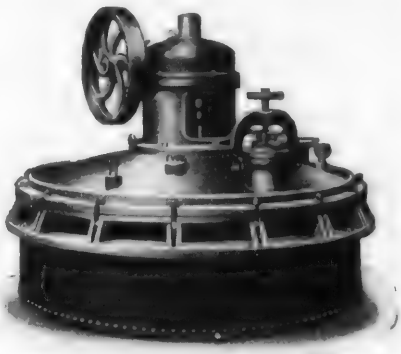

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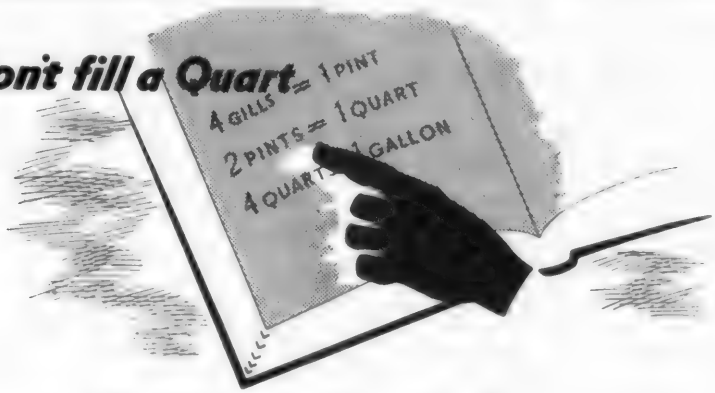
A Pint won't fill a Quart



PRESENT-DAY jam regulations, together with the dependable quality of "ELPEX" Apple Pectin, have caused the demand greatly to exceed the supply, and whilst we regret we cannot produce all that is asked for by our old and regular customers, we should like all users to know that we are doing our utmost to meet their requirements as far as possible.

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APPLE PECTIN

TO EMPLOYERS OF FEMALE LABOUR

How to avoid Loss in Output

due to Women's "Off-Days."

DYSMENORRHŒA (periodic pain, headache, backache, or even just that monthly "off-colour" feeling) results in thousands of lost working hours amongst women employees. Hours *needlessly* lost. For this disadvantage of woman labour *can* be overcome, as many firms employing large numbers of women and girls have found to their advantage.

The Nurse in charge of the Welfare Department of a large firm engaged on important work writes:

"*Baxen is the speediest and most efficient treatment. . . . The improvement in the loss of time from production is remarkable. Where before, anything from half an hour's rest to one hour was common, now the girls are given two Baxen Tablets and a drink and (except in very, very severe cases) they return to work.*"

Two tiny BAXEN Tablets (or one Powder) given to the Dysmenorrhœa sufferer at first indication of pain or distress, bring swift relief from pain. And Baxen may be given with confidence since it is absolutely safe in use, contains no aspirin, and does not affect the heart, stomach or any natural function.

Amongst the well-known firms who dispense Baxen to women employees are:

Batchelor's Peas Ltd.
British Bemberg Ltd.
Brown Bros. (Aircraft) Ltd.
Littlewoods Mail Order Stores, Ltd.
Renold and Coventry Chain Company Ltd.
R. and W. H. Symington & Co. Ltd.
Triplex Safety Glass Co. Ltd.
Vickers Armstrongs Ltd.
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Free Trial Supply

May we suggest that you mark this announcement for the attention of your Welfare Supervisor, to whom we will gladly send, without obligation, full details of the preparation and a free trial supply of BAXEN Tablets and Powders so that they may be tested in actual practice.

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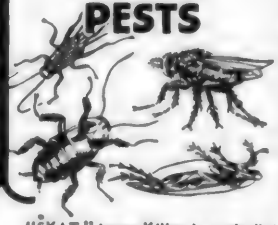
RAT PASTE ⋎ INSECT KILLER

means

DEATH! *to* RATS AND MICE

"SKAT" Rat Paste offers sure protection against the ravages of rats and mice. Non-poisonous. Prices: 1/6, 2/6, 5/- each.

DEATH! *to* INSECT PESTS



"SKAT" Insect Killer is unrivalled for destroying Silver or Steam Flies, Beetles, Crickets, Cockroaches, etc. 1-lb. cartons from 3/- each. Liquid, 2-pint can 5/- each.

and protection to the NATION'S VITAL FOOD STOCKS!

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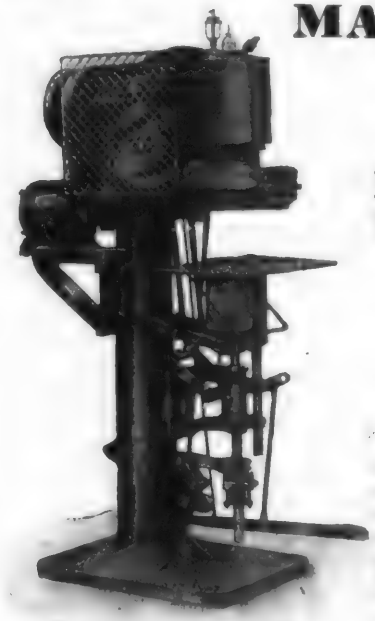

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NO Exhausters
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closes 20 cans a minute with stationary can, four roller, patent automatic seaming head.

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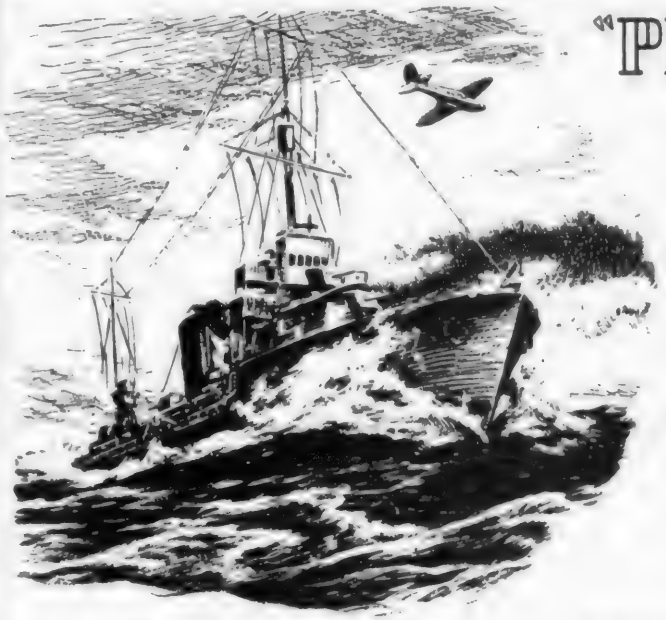
STATEMENT OF ACCOUNTS
December 31, 1941

LIABILITIES	£
Capital paid up	15,158,621
Reserve Fund	12,410,609
Current, Deposit and other Accounts	687,206,091
Acceptances and Confirmed Credits	4,886,593
Engagements	9,815,130
ASSETS	
Coin, Notes and Balances with Bank of England	75,553,266
Balances with, and Cheques on other Banks	30,257,946
Money at Call and Short Notice ...	22,214,419
Bills Discounted (British Treasury Bills £30,196,989)	33,461,839
Treasury Deposit Receipts ...	159,000,000
Investments	206,146,013
Advances and other Accounts ...	169,812,486
Liabilities of Customers for Acceptances, etc.	14,701,723
Bank Premises	9,089,436
Shares in Yorkshire Penny Bank Ltd.	937,500
Shares in Affiliated Companies ...	8,302,416

Head Office: POULTRY, LONDON, E.C.2



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Whatever the weather, our convoys come through bringing food and munitions to our Island home, and our watchful Navy brilliantly fulfils its task of protection. It is up to us in this country also, to protect and preserve all our available food supplies.

Poppe Rubber Rings for the packing and preservation of food, ensure a "safe passage" for your product in its "voyage" from factory to consumer.

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FOR ALL TYPES OF FOOD PACKING BY HAND OR MACHINE. SAMPLES OR ADVICE WILLINGLY SENT ON APPLICATION.

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MEAT
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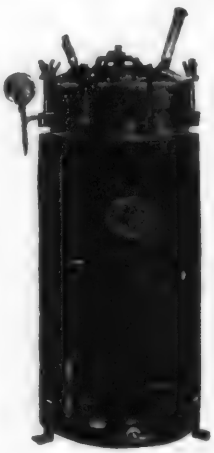
NO STEAM PIPE CONNECTIONS



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Range	- -	0-14 pH
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Let Magnetic Valves take complete charge of your system of temperature control. They need no watching, no supervision—Magnetic Valves maintain temperature thermostatically and so save valuable man and woman power. Easy to fit to existing installations, the Magnetic Valve Control System has many applications in industry. May we send you details?

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Produced from the celebrated D.C.L. Pure Culture Yeast, and obtainable in the following grades:

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For **Medicinal** use, in ground or powdered form.

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A "fuggy" atmosphere is ideal for the breeding and multiplication of infectious germs and regular purifying of the air is a vital necessity. Horton W.T. Anti-Germ Spraying Fluid offers a simple and effective means of keeping the air clean and pure. It is a safeguard against the spread of infection, loss of labour through illness and its use is a necessary precaution in all factories and workshops, particularly where two or more shifts are working.

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W.T. ANTI-GERM SPRAYING FLUID

is a highly concentrated germicide which, sprayed from an atomiser, has the triple action of washing, deodorising and disinfecting the air.

Price, 26/- per gallon. Carriage paid.
Dilution: 1 part in 150 parts of water.
(Six teaspoonsful to one gallon.)
Perfumes: Pine, Eau-de-Cologne, Coal Tar, Bouquet.
Write for Free Sample.

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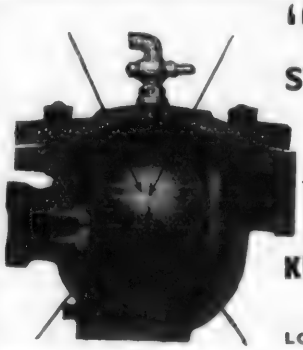

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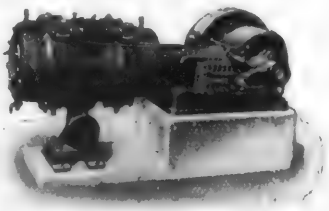

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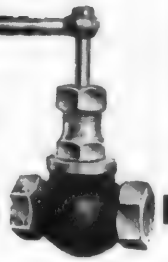
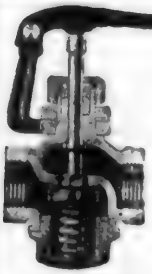


No. 70



No. 76

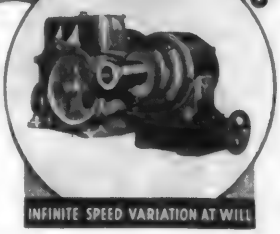
The valves are heavily made in gunmetal, fitted with renewable composition discs for any service, giving long life with low cost.

We specialise in reducing valves, steam traps, and control valves for any duty.

BRITISH STEAM SPECIALTIES LTD.

FLEET STREET, LEICESTER

Crofts patent VARIABLE SPEED V-ROPE PULLEY DRIVES



Enables Machine Speeds to be increased or decreased at will.

Can be fitted to any Make and Type of Motor. Will drive in any position.

Standard Units in Sizes from Fractional Horse Powers upwards.

Ratios up to 4 to 1. Any Speed Reductions.

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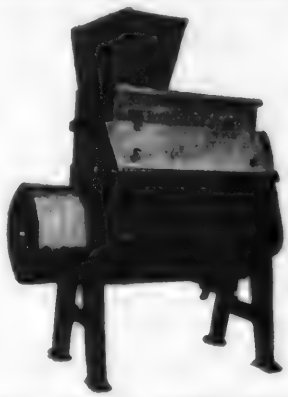

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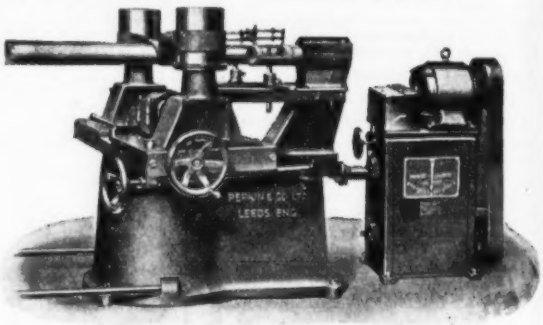

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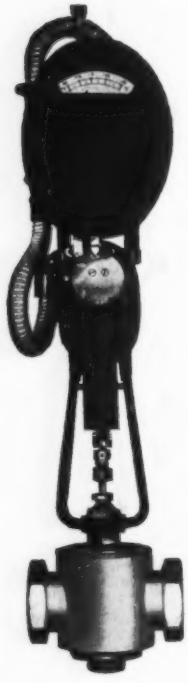

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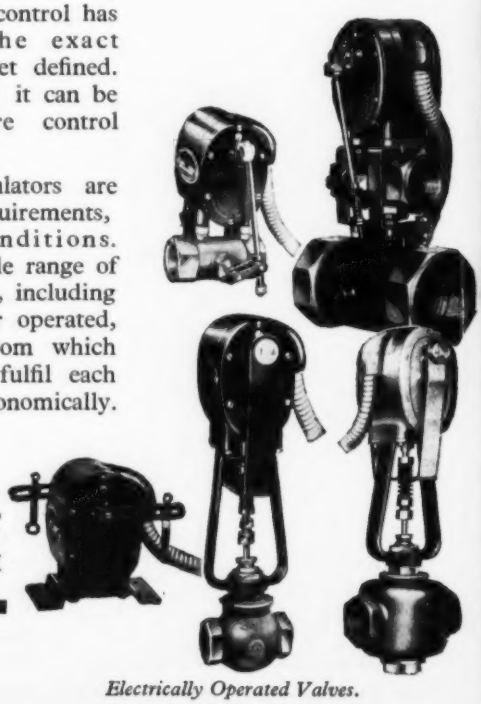
This combination, though well suited to many applications, has the limitation that the controlled valve is either full open or shut, a condition favourable to the development of "hunting."

A "floating" type of electric control has recently been developed, the exact limitations of which are not yet defined. It is established, however, that it can be adapted to many temperature control applications.

Applications for automatic regulators are often individualistic as to requirements, plant factors, and working conditions. This is why we maintain a wide range of different types of control units, including electrically operated, air or water operated, and self-operated regulators, from which equipment may be selected to fulfil each application satisfactorily and economically.



Electrically Operated Valves.

THE DRAYTON REGULATOR & INSTRUMENT
WEST DRAYTON CO., LTD. MIDDLESEX

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